BUSINESS STRATEGY AND ORGANISATIONAL PERFORMANCE: AN ANALYSIS OF THE PORTUGUESE MOULD INDUSTRY

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[1] a five year degree

Abstract

Business Strategy and Organisational Performance: an analysis of the Portuguese mould industry

There is a vast literature on business strategy and organisational performance particularly within an American context. However, little attention has been given to the development of a more complete, integrated and holistic view of the inter-relationships between business strategy, the dynamics of strategy and organisational performance: this is the key aim of this thesis.
The current research, attempts, based on Miles and Snow's (1978) strategic typology, to understand the process of business strategy development and the overall implications on organisational performance in the context of the Portuguese mould industry. The purpose is to:

- Test the applicability of Miles and Snow's strategic typology to the Portuguese mould manufacturing industry, using a series of cross-sectional studies covering the period from 1980 to 1997 in five tranches.
- Test the dynamics of Miles and Snow's strategy types, using longitudinal analysis specifically to explore how business strategy has evolved over the years in response to environmental changes (from 1980 until 1997).
- Test the overall implications of the static and the dynamic viewpoint of Miles and Snow's strategy types on organisational performance.

Data was collected using a variety of methods including in-depth, face-to-face interviews with top managers, and the development of a highly detailed questionnaire survey instrument conducted in 63 Portuguese mould manufacturing firms. The firms contacted represented 70% of all firms in the sector.

The current research reveals that the typology is applicable to the Portuguese mould manufacturing sector. All the four strategy types were reported by top managers with Defenders, Prospectors, Analysers far outnumbering the Reactor strategic type. While many findings were consistent with the typology, some inconsistencies were found and these are suggested to be related to the organisational size of the strategy types in this industry, and its development.

The current research findings have also shown that, contrary to the theory expectations, organisations do change their strategy over time. Firms have changed their strategy from Defenders to primarily Analysers. The research also reveals that there are significant differences in organisational performance between types of firms from a cross-sectional perspective, as well as from a dynamic viewpoint. In a constantly changing environment, Prospectors have outperformed Defenders.

The conceptual framework - and resultant operational model developed - have proved to be an effective tool in improving our understanding of the complex inter-relationships between

business strategy, generic strategy and organisational performance, that will assist managers and economic developers to improve the quality of their decision-making.

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Abbreviations

CAD - Computer Aided Design
CAE - Computer Aided Engineering
CAM - Computer Aided Manufacture
CAP - Computer Aided planning
CEFAMOL - Portuguese Association for the Mould Industry
CENFIM - Professional Training Center for Metallurgy and Metalworking Industry
CENTIMFE - Technical Center for mouldmaking and special Tooling Industries
CIM - Computer Integrated Management
CNC - Control Numeric Command
EDM - Electrode Design manufacturing (Electric discharge machines)
Esc. - Escudos, the Portuguese currency.
Fabrica Nacional/FEIS - Fábrica Escola dos Irmãos Stephens (National factory - School Factory of the Stephens brothers).
FEA - Finite element analysis
HS - Harmonised system
ICEP - Investments, Trade and Tourism of Portugal
PIMS - Profit Impact of Market Strategies
PMMF - Portuguese Mould Manufacturing Firms.

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CHAPTER 1

Introduction

1.0. Introduction

The purpose of this investigation is to gain a comprehensive insight into the relationship between business strategy and organisational performance. It attempts to understand the process of business strategy development, the dynamics of business strategy and the overall implications of this on organisational performance in the context of the Portuguese mould industry. The overall aim is to develop an in-depth understanding of the Portuguese mould industry but within that broad aim; there are a number of more specific research questions. These include revealing how the industry operates and has operated; how firms develop their strategies; and how strategy evolves over time (in particular, an objective is to explore how firms react to the changing environment and whether they radically change their strategy or maintain their strategic stance and modify it by making only minor adjustments). A further objective is to explore the effects of firms' business strategic behaviour on organisational performance and, in particular to explore if performance is related to the different strategic stances that firms may adopt. The research attempts to do this by exploring the applicability of Miles and Snow's (1978) strategic typology to the Portuguese mould industry. These, then, are the main aims of the research. The purpose of this chapter is to introduce these aims and to contextualise the research.

Given that this research has been conducted in the field of management, the objective is to develop insights based on theory, conceptual frameworks and robustly analysed data that will be effective in informing both industrial policy and organisational development. These are two arenas that are often seen as discrete but this research will reveal that the performance of different business is directly related to the strategic stance of individual companies and their capacity for strategy thinking and adaptation. The mould sector in Portugal is seen as a sector

that has considerable development potential and it is a sector in which the Portuguese government has chosen to invest. Consequently, it is hoped that this research will provide insights that will be instrumental in shaping more effective policy.

This chapter is divided in seven main sections. The first section identifies the overall field of the research, i.e. business strategy and organisational performance and discusses the "domain" in which the research was conducted i.e. the Portuguese mould industry and its changing environmental context.

The section also points to previous research in the field. It outlines the theoretical and methodological research gap, which justifies and supports the need for further investigation. Essentially, prior research had taken a largely static perspective and not explored the evolution of strategy (this required the development of new modes of analysis and new frameworks).

The third section, based on the previous section, i.e. the identification of the literature gaps, states the purpose of the research.

The analysis of the literature has allowed the identification of key elements of business strategy and organisational performance. These elements form the research conceptual framework. The development of the conceptual framework and the research hypotheses constitute the fourth section.

Based on the conceptual framework the fifth section illustrates how the data is collected, i.e. the research methodology.

The following section describes the importance of the current research; it emphasises its originality and contribution to the knowledge.

In order to assist the understanding of the research process, the seventh section describes the thesis structure.

1.1. Background to research

The Portuguese mould industry is of major economic significance at the national and regional level. Nationally, it consists of more than 250 firms, employs 7000 people, and exports approximately 90% of its production accounting for 65.745.666 billions Escudos in 2001[1]. According to CEFAMOL and ICEP[2], the industry has major potential for future economic growth and development. Therefore, developing an insight into how this sector is structured and how it operates based on the development of rigorous conceptual framework and robust data is of major importance to the development of industrial policy. Of academic significance is the fact the industry has been studied at a time in which the business environment has changed radically. In the early 1980s (the period for which the first tranche of data was collected) economic conditions were both different and less turbulent than in the 1990s - an era when globalisation pressures and cost reduction became particularly prevalent. The study will focus on exploring the dynamics of strategy over this period. Since the 1980s there have been significant environmental changes. These changes have included an international economic crisis in the beginning of the 90s; Portugal's entry to the European Community; increasing competition from low employment cost economies; increasing customer demand; new ways of doing business (i.e. the development of stronger supply chain); an increased emphasis on quality; a growing requirement for innovation and new technological developments pushing the demand for complex and sophisticated product – injection moulds. Within this changing context, managers have had to stay in business and at least remain viable hence the importance of firms becoming more adaptable to changing circumstances and of firms developing their capacity for strategic change to improve their level of business performance.

1 An estimated value for 2001, Source ICEP - Investments, Trade and Tourism of Portugal,
2 CEFAMOL – is the Portuguese Association for the Mould Industry, and ICEP – is the Investments, Trade and Tourism of Portugal institution, equivalent to the Department of Trade and Industry in the U.K.

These changes external to the firm have created a variety of different settings in which firms have had to react, and this exposes the importance of the concept of a firm's strategic stance as it is through the adoption of a strategic stance that a firm mediates its relationship to its external operating environment. What is important is that firms can adopt different stances and different strategic behaviours. The purpose of this research is to categorise and define these stances and to explore what impact adopting a given stance has on a firm's performance.

To adjust to these environmental changes firms may have to change their markets and the industries they serve; they may have to specialise their production; they may have to become more aggressive with their marketing; they may have to innovate and adopt more sophisticated production technologies; and they may have to change their organisational structure. Thus by exploring how firms have adjusted to the changing environment, the study of this industry will allow us to develop a better understanding of the business strategy development process, its key elements, and it will allow an exploration of the impact of these changes on organisational performance.

In order to gain a in depth understanding of business strategy, literature on the concept of strategy, the key elements that shape business strategy development and the dynamics of business strategy has been explored and analysed. To understand the meaning of business strategy it is important to identify its origins. Strategy has its origins in ancient Greece. It appears in the military context as a mean to conquer geographic positions. The concept has evolved over the years and within the organisational business context several researchers have contributed to its development (e.g. Chandler 1962, Andrews 1980, Porter 1980, Quinn 1980, Rumelt 1986, and Mintzberg 1987 among others). The identification and analysis of similarities and differences on the concept of strategy among the most prominent contributors has resulted in the development of a definition of strategy, i.e. the concept of *effective strategy*. However, as Mintzberg and Quinn (1996) have suggested there is no best way to define strategy. Strategy must be understood in its context and time setting. The development

of strategy results in an interactive process between the organisation and its external environment. In order to succeed organisations must generate or sustain competitive advantages. Over the years researchers have identified different key competitive factors that create or sustain organisational competitiveness, whether within the organisation or in an organisation's external environment. Literature on key competitive factors that create or sustain organisational competitiveness has been explored and analysed and are presented in a later chapter. While the concept of strategy is important to this research, of more importance is the dynamics of strategy and the process by which it seeks to maintain a degree of "fit" between its internal arrangements and its external environment in order either to perform well or just stay in business. As the environment changes, firms may reinforce some key competitive factors or may search and develop others. Over time, firms may change their strategic behaviour or maintain their strategy making minor adjustments. The current research focuses primarily on trying to understand how firms' strategic behaviour evolves over time, i.e. the dynamics of strategy. The extensive literature on the dynamics of business strategy has been also examined and is discussed in a later chapter.

The key aim in the review of the copious literature on the concept of strategy, the key strategic elements for sustainable competitiveness and the dynamics of business strategy was not to provide a catalogue of this research but to assist the process of identifying the key aspects of strategy, the dynamics of strategy and strategic behaviour that would help the researcher develop a conceptual framework that would structure the research and ensure that it is both theoretically grounded, procedurally robust and coherent. Given the centrality of the assertion that differences in business performance is associated with firms adopting different strategic stances or behaviours, it was important to develop or adopt a means of categorising the strategic behaviours of firms. Consequently, the literature on generic strategies and strategic typologies has been extensively reviewed and is discussed in a later chapter. In an attempt to understand the foundations of successful organisations and their strategies, researchers have identified common patterns of organisational behaviour, i.e. strategic groups. A group of firms within an industry that follows the same or a similar strategy will comprise a strategic group (Porter, 1980). More recent research has categorised firms that conceptualise their external

environments similarly as “cognitive communities” (see Porac, Thomas, and Baden-Fuller, 1989 and Porac and Thomas, 1994). The literature posits that different strategic groups display or reveal different strategic behaviours or stances. Hofer and Schendel (1978:160) stressed that “strategic categorisations involve a different pattern of competitive position objectives, investments and competitive advantages”. The literature suggests that companies use a wide variety of different strategies to compete in the same environment. Consequently, given the concept of the strategic group, it was imperative to craft or adopt a framework within which the strategic behaviours and stances of firms could be categorised.

From within a vast literature on generic strategies and strategic typologies, the current research has adopted the Miles and Snow’s (1978) typology as a viable operational framework. The typology has been widely studied and has been used by researchers in many different contexts. Miles and Snow have developed a typology that endeavours to describe and predict the process of organisational adaptation to the environment. This process deals constantly with three main “problems”: the entrepreneurial, the engineering and the administrative. As a result, the typology has identified four different strategic behaviour patterns or strategy types: these have the labels Defenders, Prospectors, Analysers, and Reactors. *Defenders* attempt to locate and maintain a secure niche in a relatively stable product or service area. They tend to offer a more limited range of products or services than its competitors, and they try to protect their domain by offering higher quality, superior service and lower prices. Often they are not at the forefront of developments in the industry. They tend to ignore industry changes that have no direct influence on current areas of operation and concentrates instead on doing the best job possible in a limited area. *Prospectors* typically operate within a broad product-market domain that undergoes periodic redefinition. They value being “first in” in new product and market areas even if not all of these efforts prove to be highly profitable. They respond rapidly to early signals concerning areas of opportunity, and these responses often lead to a new round of competitive actions. However, they may not maintain market strength in all of the areas it enters. *Analysers* attempt to maintain a stable, limited line of products or services, while at the same time moving out quickly to follow a carefully selected set of the more promising new developments in the

industry. They are seldom “first in” with new products or services. However, by carefully monitoring the actions of major competitors in areas compatible with its stable product-market base, they can frequently be “second in “ with a more cost-efficient product or service. *Reactors* do not appear to have a consistent product-market orientation. They are usually not as aggressive in maintaining established products and markets as some of their competitors, nor are willing to take as many risks. Rather the organisation responds in those areas where it is forced to by environmental pressures.

The extensive literature on the Miles and Snow’s framework covering both empirical support for the framework and criticisms of it, has been reviewed and is discussed in a later chapter. The analysis and discussion of the Miles and Snow’s (1978) strategic typology provides the underpinning to the conceptual framework used to structure this research and it contributes a number of insights, which helps develop our understanding of the process of business strategy development.

As one of the main aims of the current research was to understand the relationships between business strategy and organisational performance, literature on organisational performance has also been explored and analysed. Concepts, empirical research and the identification of methodological gaps have been identified and discussed. It is believed that different strategic behaviours would be reflected in different levels of organisational performance. The identification and analysis of organisational performance has allowed further developments on the current research conceptual framework and has enriched the understanding of business strategy and organisational performance relationships. An important contribution of this thesis has been the development of a more comprehensive analytical framework, which integrates thinking on the strategic behaviour of firms and business performance. The developments that are outlined later will reveal how the business strategy dimension has been integrated with the business performance dimension to provide a more comprehensive framework for the conduct of applied industrial analysis. The literature reviewed is discussed in Chapter 2 (more details can be found in the associated appendix to literature).

Having explored the literature on business strategy and organisational performance and taken the necessary insights to develop the conceptual framework, there was a need to understand the Portuguese mould industry context and how it had evolved since the 1980s to respond to a small number of dramatic and a large number of "perturbations" in its operating environment. Specific literature on the Portuguese mould industry has been investigated. The analysis has revealed the key elements that shape business strategy for the Portuguese mould makers, the understanding of how business strategy has evolved overtime as the environment undergoes continuous and discontinuous changes, and the implications of firms' strategic behaviour on organisational performance. The insights gained allowed further refinement of the conceptual framework to make the framework more responsive to the specific context of the sector. The Portuguese mould industry environmental context is described in chapter 3 (further details can be seen in the related appendix).

The analysis of the literature has allowed the identification of theoretical and methodological gaps that need to be addressed. The issues are discussed in the next section.

1.2. The identification of the theoretical and methodological gap in the literature

There has been much written concerning business strategy and organisational performance, especially within the American context. However, relatively little attention has been given to the understanding of business strategies, the dynamics of strategy and their impact on organisational performance. The Miles and Snow's strategic typology has been extensively studied (see Snow and Hrebiniak 1980, Hambrick 1982, McDaniel and Kolari 1987, Namiki 1989, Smith, Guthrie and Chen 1989, and Conant, Mokwa and Varadarajan 1990, Floyd and Wooldrige 1992, and Thomas and Ramaswamy 1996, among others). Nonetheless, the analysis of business strategies, the dynamics of strategy, and the organisational performance relationships has been surprisingly neglected even within the large body of extant research.

Most of the researchers, when testing the Miles and Snow's typology, have only analysed one or two of the typology three main "problems" of adaptation to the environment (i.e. the

entrepreneurial, the engineering or the administrative). Additionally, research has often been focused on the Defender and the Prospector strategy types, assuming that the Analyser fits somewhere in between these two and that the Reactor is a non-consistent strategy and therefore not of interest to investigation.

Moreover, Miles and Snow's strategic typology has most often been deployed within cross-sectional studies "at a point in time". Cross-sectional studies are considered appropriate as they underline the notion that strategic types are considered to be equally viable across different environmental contexts, and consequently across time (but this assertion is rarely tested). The findings from cross-sectional studies are largely consistent with the theory that underpins the typology. The many cross-sectional studies analyse sectors at a specific point in time, yet the concern here is to take a more dynamic perspective and to explore how firms change their strategy types over time or remain in given categories in response to changing environmental conditions. It has already been mentioned that the environment of the Portuguese mould sector has changed radically since the 1980s, yet little research has sought to test if different strategic behaviours or mixes of behaviours may not be equally viable across different environmental contexts. Therefore, further investigation on the dynamics of strategy is required to test the applicability of the framework/typology in order to advance our knowledge about the relationship between environmental change and strategic behaviour.

With the exception of Zajac and Shortell (1989) there are no previous attempts to use the Miles and Snow's typology in a dynamic context where change over time is made explicit. For example, there is little knowledge drawn from detailed sectoral studies which reveals whether firms change their strategies over time or just engage in minor alterations or whether firms change their strategies in response to environmental shifts or what the pattern of movements between different strategy types has been. Additionally, Zajac and Shortell (1989) have only analysed strategic change from one timescale to another. The current study has used five different timescales, which is believed to enrich the knowledge of the dynamics of strategy and gives further consistency to the results.

The literature review has revealed that related to organisational performance, researchers have only used one or two organisational performance measures, or have used subjective measures of organisational performance. It is contended that more performance indicators are required if we are better to identify and understand the relationship between organisational performance differences and adopting, changing or retaining different strategic behaviours. Additionally, the review revealed that researchers were not consistent in the organisational performance measures that were employed. Therefore, the reliability of the results drawn from comparing organisational performance in different strategy types may have been compromised: essentially, it may have been biased by the lack of consistency in the measurements taken.

The Portuguese mould industry provides a major opportunity for the conduct of new research. Not only is it a sector of major national and regional significance but it is also massively under-researched. Researchers have also only analysed some aspects of the organisational business strategy, such as technology or marketing and have used cross-sectional studies. No prior empirical studies are known within the Portuguese mould manufacturing firms testing the applicability of the Miles and Snow's strategic typology, the dynamics of strategy or the overall implications of strategic behaviour on organisational performance using longitudinal studies. There is no consistent, systematic and holistic study of the sector. Hence this study has created new understandings of the relationship between business strategy and business performance in this sector. However, despite the specificity of the research to the sector, it is contended that the framework that has been developed is portable to other settings.

1.3. The purpose of the research

In order to enhance further understanding of business strategy, the dynamics of business strategy and the overall implications on organisation performance in Portuguese mould manufacturing sector, the present study will:

- Test the applicability of Miles and Snow's strategic typology to the Portuguese mould manufacturing industry using a series of cross-sectional studies covering the period from 1980 to 1997 in five tranches.
- Test the dynamics of Miles and Snow's strategy types, the data generated in longitudinal mode, specifically to:
    - Explore how business strategy has evolved over the years in response to environmental changes (from 1980 until 1997).
    - Investigate how firms adapted to the changing environment and to discover whether firms changed their strategic behaviour over time (discontinuous changes) or whether they have made minor adjustments (incremental changes).
    - Discover the pattern of change between different patterns of behaviour.
- Test the overall implications of the static and the dynamic viewpoint of Miles and Snow's strategy types on organisational performance.
- Test the consistency of the self-typing paragraph approach to identify strategy types.
- Develop an in-depth understanding of how the specific business sector operates, i.e. a robust understanding of the meaning of strategy and the process of business strategy development for the Portuguese mould managers and their context as refining this understanding is an important input to the development of industrial policy and strategy.
- Provide a model that illustrates and explains the above inter-relationships, i.e. a framework that allows an integrated analysis of business strategy, the dynamics of strategy and organisational performance.

The frameworks developed above will allow a series of hypotheses to be tested. These hypotheses are described in the next section.

1.4. The research hypotheses

From a review of the literature, several hypotheses are developed and presented in detail in Chapter four. For example, given the literature we should expect that the four strategy types

would appear in the Portuguese mould industry in a given pattern with Defenders, Prospectors, and Analysers being equally distributed and far outnumbering the Reactors. Given the differing profiles of these firms we might expect Defenders to maintain their product-market domain. Conversely, Prospectors and Analysers are expected to change their product-market as environmental conditions change. Defenders are expected to place a greater emphasis on price, quality, delivery time and on technology efficiency. In turn, Prospectors are likely to place a greater emphasis on innovation, marketing, providing a more varied range of services and on adopting more varied and advanced technology. Prospectors would be expected to employ more qualified and younger employees than Defenders. The literature is replete with expectations about how we can expect different types of firms to behave as their environments change and these will be explored in depth in Chapter two.

Another core aim was to explore the relationship between strategic behaviour and organisational performance. Given that the literature looking at this relationship is less well developed, the prior expectations were less clear than in the section above. However, from the literature it would be expected that any of the three viable strategy types (Defenders, Prospectors, and Analysers) are equally likely to perform well and will consistently outperform the Reactors. Miles and Snow (1978) have suggested that Defenders view organisational performance primarily in terms of efficiency while Prospectors see performance primarily in terms of effectiveness (i.e. in terms of new product and market development). However, Hambrick (1983), Namiki (1989) and Zajac and Shortell's (1989) findings have contradicted the theory. The three strategy types do not perform equally well in a given environment. Hambrick (1983) has suggested that performance differences in strategy types depend on the choice of performance measures employed and the nature of the environments. Therefore, in order to gain a comprehensive understanding of organisational performance and strategic behaviour several more detailed hypotheses are develop which are articulated in more detail in Chapter two.

The research was also interested in investigating the dynamics of business strategy. Miles and Snow suggest that Defenders are more suited to an environment of greater stability and

Prospectors fit a more dynamic environment. A focus of the research is to examine how firms, in order to adapt to the changing environment, may change their strategies. Zajac and Shortell (1989) have demonstrated that firms do change their strategy type over time but our objective here is to identify patterns in behaviour and to explain them. Given that being a Defender may be a more appropriate stance in stable environments, we might expect that, as the environment has become more uncertain, that Defenders may have changed to Analysers and Prospectors. A series of hypotheses about how firms might behave as the environment has changed has been distilled from the literature and they are tested in Chapter six.

Furthermore, the research has suggested that different forms of strategic adjustment will be reflected in differing business performance. An objective is to examine, in a static sense, if different types of firm (categorised by their strategic type) perform equally across different environmental settings or if there are significant differences in performance across the strategic types. Taking a more dynamic view, an attempt will also be made to discover if firms that have changed their strategy outperform those that have not and whether firms that have changed from one specific strategy type to another outperform those that have changed to other strategy type.

Zajac and Shortell (1989) have demonstrated that strategies were not equally viable across different environmental settings and that performance varied by strategic type. Their findings suggest that organisations embedded in dynamic environments and employing the Defender strategy type, were likely on average, to be less profitable than those pursuing other strategy types. They also found that in changeable environments, Prospectors and Analysers outperformed Defenders. While they found that different levels of performance were exhibited across strategy types, they were unable to find differences in performance between those that had changed strategy compared to those who had not. There were also no significant performance differences between firms that had changed to one specific strategy type and those that had changed to other strategy type, i.e. firms that had changed to Analysers or Prospectors may or may not have outperformed those that have changed to Defenders.

Based on Zajac and Shortell's (1989) research it would be expected that Defenders on average in dynamic environments perform poorly relatively to Analysers and Prospectors. In a constant changing environment Prospectors and Analysers outperform Defenders. There would not be significant performance differences between those firms that have changed their strategy, i.e. the *movers*, and those that have not changed, i.e. the *stayers*. Additionally, there would not be significant performance differences between firms that have changed to one specific strategy type and those that have changed to another strategy type. A series of formal hypotheses were developed from the literature and these are tested in Chapter six.

The research also focuses on assessing the convergent validity of the Self-Typing Paragraph approach to identifying strategic types. The aim was to know whether the perception of the Portuguese mould maker's strategy was consistent with the theory and the researcher's knowledge and understanding of what the firm's strategic behaviour appeared to be. The researcher's knowledge was based on the information gathered on the interviews with managers and the unsaid information, e.g. visits to the manager's plants, observation of their surrounding environment, and secondary data. Based on previous studies, it is expected that the Self-Typing paragraph approach is a valid measure.

The conceptual framework and hypotheses are outlined and analysed in Chapter 4. The conceptual framework attempts to describe and explain business strategy and organisational performance relationships within the Portuguese mould industry context. The conceptual framework structures the research methodology. The next section describes the research methodology.

1.5. The research methodology

To test the hypotheses and the research aims, the current study has used a hybrid research strategy. The research strategy in its primary data collection has comprised two distinctive stages. The first stage was qualitative and exploratory, the second, was quantitative,

descriptive and explanatory. In the first stage a critical analysis of the literature, secondary data, in-depth interviews and semi-structured interviews with top managers were conducted in order to identify key strategic factors that describe business strategy development, how firms have changed their business strategy over the years, i.e. the dynamics of strategy and the overall implications on organisational performance. In the second stage of the primary data collection, the aim was to generalise, validate and explain the Portuguese mould manager's strategic behaviour. In order to accomplish this, a questionnaire was developed as a base for a longitudinal study. The qualitative data collection was conducted to support the development of the questionnaire and consequently to ensure the reliability and validity of the research findings.

During January-February 1997 and August 1997, a questionnaire was carried out with 63 top managers in the Portuguese mould manufacturing industry, representing the sample almost 70% of the total sector. SPSS was used for the analysis of the results. The research methodology is discussed in depth in Chapter 5.

The current research has attempted to fill the gaps in the literature and therefore to advance knowledge to the understanding of business strategy and organisational performance relationships. The aim was to gain new theoretical insights as well as provide managerial tools to improve organisational competitiveness. The originality of the current study and its contribution to the knowledge are described in the next section.

1.6. The originality of the study and the contribution to the knowledge

1.6.1. The theoretical contribution

The current research attempts to enhance further knowledge to Miles and Snow' strategic typology, business strategy development, the dynamics of strategy, i.e. how business strategy evolves over time and the overall inter-relationship of strategy with organisational performance.

Moreover, with very few exceptions, strategic typologies have been mainly tested in an American context. This study has explored the applicability of Miles & Snow's strategic typology to the Portuguese mould manufacturing firms. There is no previous research which attempts to explore the Miles and Snow' strategic typology, the strategy types, in a static and dynamic viewpoint, and the overall implications on organisational performance within the Portuguese mould industry.

In addition, the typology was explored in all its "problems" (i.e. the entrepreneurial, the engineering and the administrative) and all its strategy types (i.e. the Defenders, Prospectors, Analysers and Reactors were investigated). Researchers have primarily concentrated their studies exploring only one or very few business strategic dimensions, e.g. technology, product-market domain, or marketing. This study has attempted to undertake a very comprehensive and in-depth analysis on business strategy involving both the analysis of the organisation and the organisation's external environment. A broad set of strategic dimensions has been developed. For the study of the organisation, strategic dimensions include product/service-market domain, marketing policy, areas of investment, people-knowledge, technological profile and organisational management. To reflect the organisation' external environment, strategic dimensions comprise customers, competitors, suppliers and environmental trends.

Cross-sectional studies have been commonly employed in the prior research uncovered in the literature review. Cross-sectional studies analyse the phenomena at a given point in time, i.e. statically. This study has explored business strategy from a static perspective as well as from a dynamic perspective. In order to analyse the dynamics of business strategy, the current research has used a longitudinal study. The timescale employed (1980-86, 1987-92, 1993-95, 1996 and 1997-a forecast) has allowed the analysis of realised, current and intended strategy (Mintzberg, and Waters, 1985, and Mintzberg, 1987). The time periods were chosen to reflect different eras in the evolution of the industry, and to analyse how managers have reacted to the changes. As suggested by the Portuguese mould makers themselves these periods have

been subject to considerable changes in the environment. They show prosperity and growth (1980-86), recession (1987-92, 1993-95) and recovery (1996 and 1997).

To explore organisational performance, the current research has used a detailed set of financial performance measures rather than the only one or two measures that most of the researchers have employed. It has used items from the balance sheet and profit and loss sheet, and from there, calculated the financial ratios themselves rather than the subjective self-reporting of these measures of financial ratios, i.e. the subjective evaluation of the firm's performance compared to competitors. Additionally, organisational performance measures were provided for 1980-86, 1986-92, 1993-95 and 1996 periods, allowing the analysis of the impact of the dynamics of strategy on organisational performance.

To explore the applicability of Miles and Snow's strategy types, this study has used a perceptual "self-typing paragraph" approach. The paragraph approach requires each respondent to read four short, unlabelled paragraph-length descriptions of each of the four strategy types, and then select the *one* description that best characterises their organisation compared with other organisations. This study, in order to enhance further knowledge on the perceptual self-typing paragraph approach, has tested the consistency of the approach. It has compared the self-perception of top managers on the typology with the comprehensive insights and the rich knowledge gained at the interviews conducted with the mould makers and the visits made to their plants.

1.6.2. The managerial contribution

The sector has never been the focus of a detailed and holistic study. The current study has enhanced further knowledge of business strategy development, the dynamics of strategy and the impact on organisational performance in Portuguese mould firms. It has developed an in-depth and robust understanding of how this specific business sector operates; of how firms develop their strategies and which were the key strategic factors that generated or sustained competitive advantage. It has explored how business strategy has evolved over the years, how

firms have adapted to environmental changes; and how firms have moved between different strategy types. The current research has also identified which organisational strategic behaviours were associated with high levels of organisational performance. The research outcomes will allow the development of a model that will help managers to better understand, conceptualise and explain business strategy, the dynamics of strategy and organisational performance relationships. The model attempts to be an important tool in predicting organisational strategic behaviour, which will help managers in their decision-making. The current research has also produced a set of guidelines illustrating possible strategic orientations, how to improve business and how to improve organisational competitiveness. The information produced also has industrial development implications and will assist the process of developing industrial policy and strategy for the sector.

In order to assist the understanding of the current research process, the following section describes the thesis structure.

1.7. Thesis structure

To facilitate the understanding of the thesis structure and its aims, the contents of each chapter are described below.

Chapter two provides an extensive review and critical analysis of previous work on business strategy and organisational performance. It reviews literature on the concept of strategy, the key strategic factors that create or sustain competitive advantages, the dynamics of strategy and generic strategies and strategic typologies. Within the generic strategies and strategic typologies the focus was on Miles and Snow's (1978) strategic typology. It presents concepts, controversial points of view, gaps in literature and methodological limitations, each justifying and supporting the development of the current research. This chapter provides the key elements to develop a conceptual framework.

Chapter three contextualises the Portuguese mould industry environmental context. It illustrates the history of the Portuguese mould industry, its growth, its economic context, and its international context. The sector is analysed strategically using SWOT analysis (Strengths, Weaknesses, Opportunities and Threats), Porter's five forces model and STEP analysis (Social, Technological, Environmental and Political). Additionally literature on the Portuguese mould industry's key competitive factors that craft business strategy and generate or sustain competitive advantages are described and analysed. This chapter has enabled the development of a robust and comprehensive understanding of how the sector operates and the factors that have and will affect it. As a result of this contextual analysis, some refinements were made to the conceptual framework. The conceptual framework was used to structure the development of research questions and the data/evidence collection process.

Based on both previous chapters, **Chapter four** produces a conceptual framework and describes the hypotheses that illustrate each aspect of the current research investigation and their interrelationships. The conceptual framework attempts to draw up an understanding of the applicability of Miles and Snow's strategic typology to the Portuguese mould industry, how business strategy develops, how strategy evolves over time and the overall implications on organisational performance. It attempts to predict organisational strategic behaviour and organisational performance relationships by illustrating possible strategic orientations. The conceptual framework forms the base for the development of the hypotheses and structures how the data is going to be collected.

Chapter five describes the research methodology used to pursue the research objectives. It discusses the research philosophy, the research strategy and purpose and the different methods of data collection. It outlines the use of the positivistic approach to strategy and the use of a hybrid research strategy in conjunction with the benefits of triangulation. The use of a hybrid strategy establishes credibility and confidence in the research findings. The utilisation of triangulation has enabled the current study to capture a complete, holistic view of business strategy and organisation performance within the Portuguese mould industry. The employment of multi methods permitted the advantages of each method to be gained, whilst

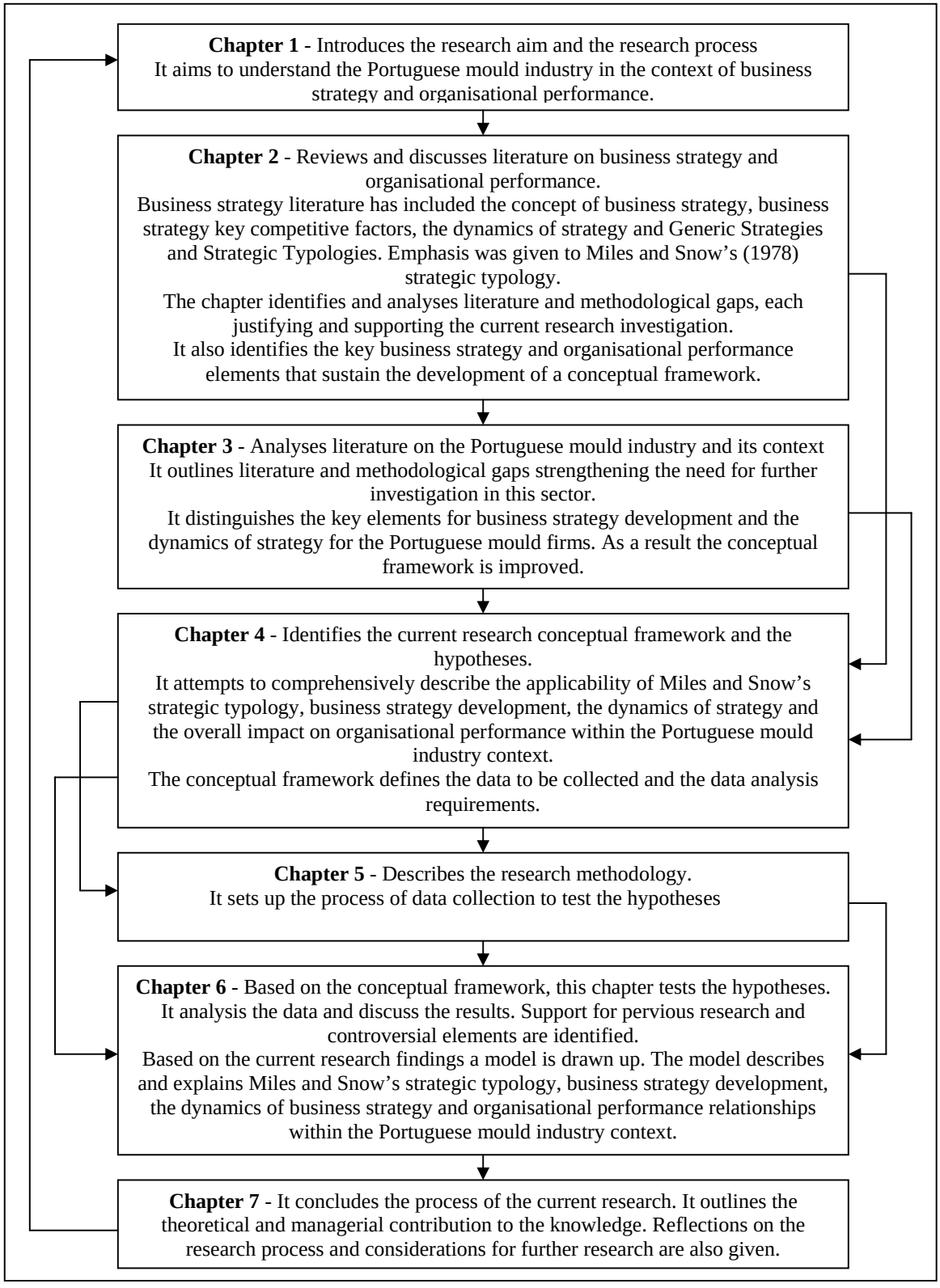
at the same time minimising its disadvantages. Qualitative and quantitative methods were use to the data collection. The data collected ranges from exploratory interviews, i.e. in-depth and semi-structured interviews to a descriptive and explanatory survey questionnaire. For each method their strengths and weaknesses are described and the conduct of the investigation is outlined and discussed in depth. Having described the research methodology the following chapter analyses and discusses the research results.

Chapter six analyses the data, presents the findings and discusses the results from previous studies. Significant support is found for previous research. However the findings have also uncovered some new elements which need to be considered in future research. Based on the current research findings the conceptual framework is consolidated into an operational model.

Chapter seven presents the conclusion of the research. Based on the current research purpose, and the development of the research problem, it confirms and rejects the hypotheses, outlining the theoretical and managerial contribution to the knowledge. Reflections on the research process and considerations for further research are also given.

In order to synthesise and facilitate the understanding of how the current research process was conducted Figure 1 has been built up. It illustrates each step undertaken and the way each chapter contribute and are interconnected in the research process.

Figure 1 - The current research process



CHAPTER 2

Business strategy and organisational performance: a literature review

2.0. Introduction

The aim of this thesis is to develop an in-depth understanding of business strategy and organisational performance relationships. It attempts to understand the process of business strategy development, the dynamics of business strategy and the overall implications on organisational performance in the context of the Portuguese mould industry. Therefore, the role of this chapter is to review the literature on business strategy and organisational performance.

This chapter comprises eight main sections. The first section reviews literature on the origins of strategy by taking an evolutionary perspective and by assessing the research of the most prominent contributors to its development. As there was a need to understand which strategic factors contribute to business strategy development, the second section outlines and discusses the literature on the key business strategic factors that may generate or sustain competitive advantages. A further aim of the current research was to understand how strategy evolves over time; how firms react to the changing environment: consequently, the third section reviews the literature on the dynamics of strategy.

The fourth section looks at ways of categorising organisational strategic behaviour. It reviews literature on generic strategies and strategic typologies in order to outline the most well known typologies and review how research has either provided empirical support for these models and on what grounds they have been criticised. Particular emphasis here is given to the Miles and Snow's (1978) typology. As a result, the fifth section describes and analyses the concept in detail and reviews research that has provided both empirical support and

criticism from both a static and dynamic viewpoint. Given that generic strategies are found to have shortcomings, the sixth section outlines these weaknesses in order to identify those areas that the research design in this project has had to explicitly address.

As one of the main aims of this research project was to gain further insights into the relationship between business strategy and organisational performance, the seventh section surveys literature on organisational performance. The review focuses on identifying the key concepts; on identifying the most often used and most robust performance measures; and on reviewing previous studies using the Miles and Snow's strategic typology to explore the relationships between strategy and organisational performance from both a static and dynamic viewpoint.

The eighth section contains a synthesis of a large and complex literature and attempts to distil those issues, concepts and operational problems that the empirical research contained in this thesis will then address.

2.1. The concept of strategy - strategy definitions

The purpose of this section is to gain a robust understanding on the concept of business strategy. Therefore, literature on the origins of the concept, its evolutionary perspective, and the most prominent contributors to its development are analysed. According to Mintzberg and Quinn (1996:xi), "there is no *one best way*" to define strategy or general recipe to shape it. Strategy is a complex phenomenon and no single conceptual definition will be able to embrace all of its nature. Strategy is unique in its nature, context and time setting. However, there are a plethora of definitions of strategy. The different definitions reflect the fact that the concept of strategy has been adapted to many different environmental contexts. To better understand the meaning of strategy it is important to analyse where the term comes from.

2.1.1. Where does strategy come from? The Military perspective of strategy

The concept of strategy has its origins in ancient Greece. The term emerged in the context of war and it is derived from the Athenian word *strategos*. It arose from the Kleisthene's democratic reforms (508/7 BC) which resulted in the creation of an Athenian war council (Cummings, 1993) called the *strategia*. The council comprised a board of 10 elected generals, the *strategos* - each one representing their own tribe (Evered, 1983). The word *Srategos* signifies a general in command of an army. The name derives from the words *stratos* and *agein*, meaning army on the ground and to lead respectively, (Cummings, 1993). The ancient Athenian concept of strategy was directly associated with the leadership role. As Frontinus (first century AD) states, strategy is "everything achieved by a commander, be it characterised by foresight, advantage, enterprise, or resolution." Pericles (450 BC) the most famous *strategia* leader added another perspective to strategy. He understood it not only as a leadership task, but also as the way to confine the risk while moving fast to secure advantage (Kagan, 1991). Aineias (mid-fourth century BC) presented another point of view and defined strategy as the capability to allocate and assess the resources to best advantage.

Sun Tzu (about 490BC) was other major influence on the foundations of the concept of strategy in a war context. In his book "The Art of the War" (Clavell, 1981), he described strategic war codes to take advantage over the enemy. He identified five war codes as well as five key elements for victory – perhaps he was one of the first people to attempt to categorise strategy into different sets of patterned behaviour. Philip of Macedonia and his son, Alexander the Great (about 338 BC; Green, 1991), like Sun Tzu, saw the aim of war as being to defeat the foe as quickly as possible at the lowest cost. Their strategic principles were based on the following suite of actions:

- establishing clear goals;
- assessing resources;
- evaluating their own and their opponent's strengths and weaknesses;
- developing full logistical support;
- using natural advantages;
- aligning their forces into a unique posture to secure a distinctive advantage;

- formulating a meticulous plan of actions and deceptive manoeuvres which were communicated throughout the army;
- weakening their opponents politically and morally using misleading messages to deceive the enemy;
- surprising and bypassing the competition.

Under control of the commander and with the close co-ordination of all units, motivated, well-disciplined and trained soldiers were prepared to attack and overwhelm the adversary. If environmental circumstances changed or outcomes did not occur as planned, the entire counterattack was re-thought and forces were re-aligned. If the strategic goal was achieved and dominance established, all the troops were rewarded (for further details see appendix 1A). What is important here is that the lexicon of strategy has changed little since ancient times with Sun Tsu's book - the Art of War - only recent having been resurrected as an inspiration to managers.

However, it is clear that military strategic principles - and the discourse used to describe it - are similar to those of the business context (see appendix 1B). Strategic themes including: leadership, knowledge, allocation and evaluation of resources, plans, assessment of organisation' weaknesses and strengths, time, sense of opportunity, feasible risk, logistics, information, alliances, uniqueness, communication, motivation, commitment, participation, co-operation, unity, co-ordination, control, rewards, costs, and re-assessment of all strategy if environmental circumstances change, apply to both the military and business settings. Modern strategic issues are actually millennia old; business strategy is rooted in principles established 25 centuries ago (for a fuller discussion see appendix 1C).

Much can be learned from the military perspective of strategy. The analysis has allowed a better understanding of the meaning of business strategy. The concept of strategy has evolved and has being adapted to different environmental contexts. A historical review of the evolution of strategy and its meaning over time within different business contexts is required to gain further insights.

2.1.2. An evolutionary perspective of the concept of strategy

The first studies of organisational strategic behaviour began to appear in the 1960s (Chandler, 1962). During the 60s and 70s, strategy came to be seen as being synonymous with corporate strategy and it was conceptualised as a formal science characterised by rational analysis and mechanistic approaches to planning. This approach to strategy became known as the *classical perspective* and was typified by the writings of Igor Ansoff (1965). In the 1980s, strategy began to be reconceptualised. Strategy was reinterpreted as a competitive process of natural selection and of survival being regulated by the external market (Hannan and Freeman, 1987). Researchers have also conceptualised strategy as focusing on the core business (Peters and Waterman, 1982), the achievement of competitiveness focused on product-market positioning (Porter, 1980) and strategic change and renewal and the match between the organisation and its environment (Pettigrew, 1985). The main goal of these different approaches was to develop an understanding of how firms could achieve competitiveness - this approach could be labelled the competitiveness perspective. Strategy was also seen as being incremental, emergent and crafted; under the influence of individual's emotions, imperfections and skills; and, a continued process of adaptation through learning and experience (Mintzberg, 1987, Quinn, 1980). This approach to strategy became known as the processual perspective.

In the 1990s, the emphasis in the strategy literature shifted away from an emphasis on issues external to the firm (e.g. market structure and the industry environment) towards the organisation's internal processes and competences (Leavy, 1996). Sustainable competitive advantage was seen to arise from the development of distinctive organisational capabilities and competences, i.e. skills and resources (Pralahad, and Hamel, 1990), which led to a perspective on strategy based on the resource-based theory of the firm (see Wernerfelt, 1984, Grant, 1991b, Black and Boal, 1994, Rumelt et al, 1991). More recently, strategy has become characterised in the literature as being synonymous with knowledge management. Knowledge management is seen as the creation of an organisational support system that produces, shares

and applies knowledge. As Sanderson (1998:10) noted the: "key to strategic advantage as a basis of competitive success will be the ability of organisations to manage knowledge." Strategy is now seen to result from peoples' ideas being in constant interaction and development. Strategy viewed as the ability of organisations to generate knowledge to support the development of new products or/and services that continuously raise customer value added (CVA) and thus strengthen the competitive position of firms.

Knowledge management[1] is the process of creating new value (i.e. the organisation's intellectual assets), which is based on the integration and interaction of skilled people and the organisation's resources. Organisations that focus on knowledge management should emphasise people development (Pearson, 1987). An organisation's intellectual assets combine intellectual capital (people expertise, ideas, know-how, competences), human capital (people collaboration, commitment, experience and learning from past experiences), and structural capital (organisation resources, e.g. information technology, structure, and culture - a shared vision) in order to create customer capital (i.e. CVA, see Stewart, 1997). As Leavy (1996:1) stressed: "Increasingly, sustainable competitive advantage is being seen to be rooted in a company's ability to innovate, learn, leverage relationships, implant vision and renew." Knowledge management involves organisational flexibility and an ability to adapt to new environmental contexts. It also requires organisations to respond quickly to issues, problems and opportunities by reducing the amount of time it takes to put new products and services into the market.

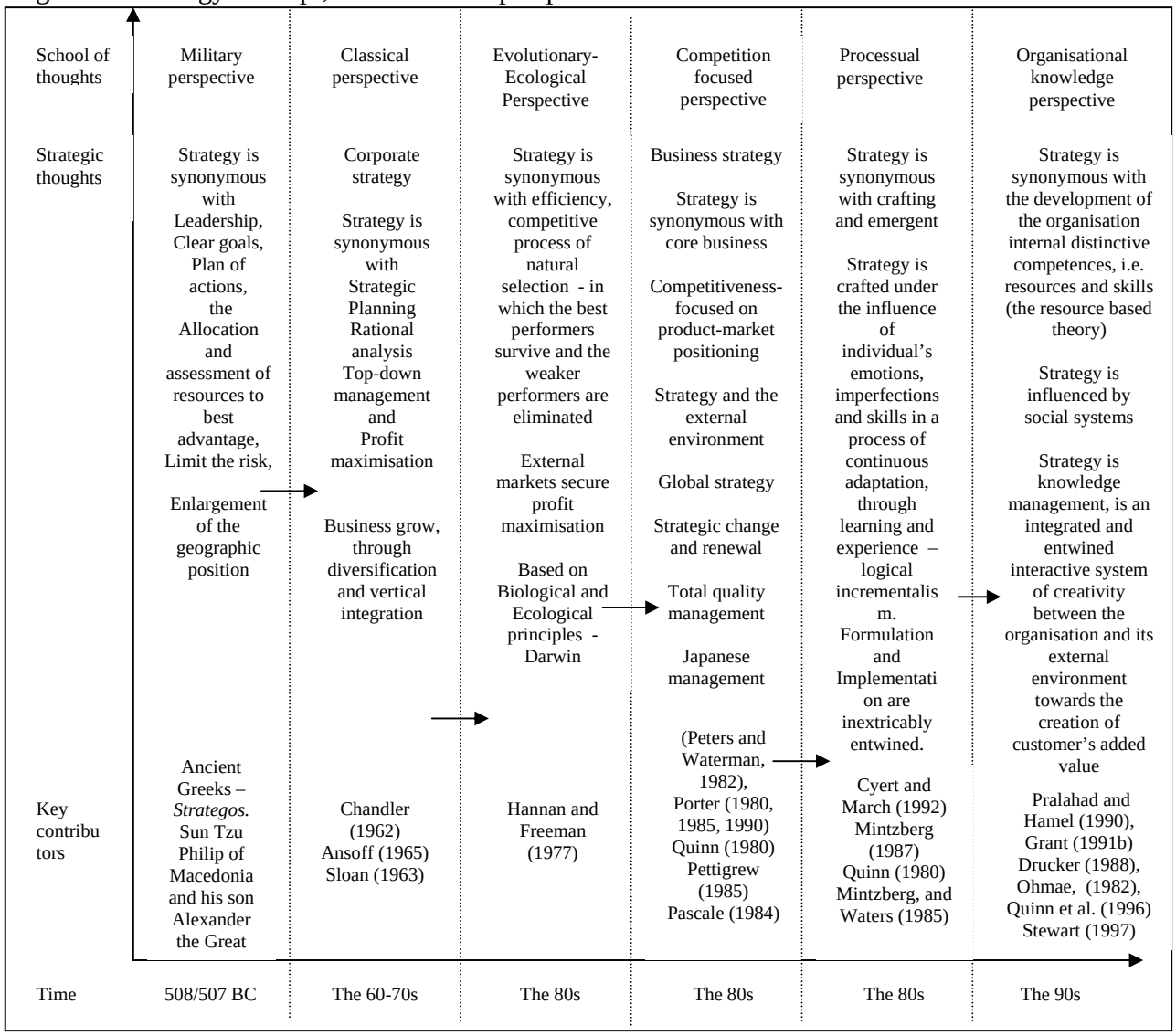
In the 90s, strategy was seen as an integrated and entwined interactive system of creativity between the organisation and its internal and external environment. Strategy is about integrated systems, responsiveness, a shared vision and flexibility, towards the fast changeable business conditions (Bates and Dillard, 1992). Organisations build their

[1] Different researchers have given different classifications to the process of knowledge creation, e.g. management of innovation (Burns and Stalker, 1966); information-based organisation (Drucker, 1988); professional intellect (Quinn, Anderson and Finkelstein, 1996); knowledge management (Lloyd, 1996) and intellectual capital (Stewart, 1997).

competitive advantages on their distinctive internal capabilities (skills and resources, technology, people and knowledge) and on their external interrelationships with their suppliers, competitors, customers in order to create and sustain CVA and satisfaction. In conclusion, strategy in the 1990s was about people, their relationships and the organisational knowledge generated by them. This approach to strategy can be labelled the knowledge management or organisational knowledge perspective.

In order to synthesise the literature reviewed and to illustrate the evolutionary perspective of the concept of strategy over time, a framework (see Figure 2) was drawn up. It identifies the schools of thought, their main features and the key contributors to the literature. Further details can be seen in appendix 1D.

Figure 2 - Strategy concept, evolution and perspectives



The analysis of the evolution of different perspectives of strategy has provided some insights into the wider concept of strategy. In the next section, some operational definitions of strategy are presented which have been drawn from the writings of the most prominent contributors to the literature on strategy.

2.1.3. The most prominent contributors to the concept of strategy - strategy definitions

By drawing together several definitions of strategy, it is possible to compare and contrast these definitions and to distil some common features and critical differences. Some of the many possible definitions of strategy are presented below.

Definitions of strategy and a distillation of common themes and elements:

a) a means to achieve ends (Andrews, 1980; Porter, 1980; Thompson, 1995).
b) the long-term goals and objectives that ensures the organisation continuity (Chandler, 1962; Hax, 1990),
c) the assessment of the organisation's resources, the development of distinctive competences and the identification of the organisation's strengths, weakness, opportunities and threats (Andrews, 1980; Quinn, 1980; Pascale, 1984; Johnson and Scholes, 1993; Kay, 1995),
d) a pattern of decisions that integrates and gives consistence, coherence and cohesion to the organisation at feasible risk (Andrews, 1980; Quinn, 1980; Galbraith and Schendel, 1983; Hax, 1990),
e) a shared system of values and beliefs (Andrews, 1980; Mintzberg, 1987).
f) a way to define the organisation's domain; the selection of products/services and markets towards the creation of economic and non-economic value to stakeholders (Schendel and Hofer, 1979; Andrews, 1980; Hax, 1990; Johnson and Scholes, 1993),
g) a creation of unique competitive advantages which should be different from competitors and difficult to copy by competitors (Schendel and Hofer, 1979; Andrews, 1980; Quinn, 1980; Porter, 1980 and 1996; Mintzberg, 1989; Kay, 1995),
h) flexible and adaptable to environmental changes (Quinn, 1980; Pascale, 1984), and,
i) the most favourable match between the organisation and its external environment (Schendel and Hofer, 1979; Andrews, 1980; Hax, 1990).

Based on the literature reviewed a framework has been developed to identify the key elements or characteristics that define business strategy (see Figure 3). Based on the development of Figure 3, it is argued that, independent of the industry or service context in which business strategy is developed, these strategic characteristics need to be considered in the design of any empirical investigation. These characteristics form what the current research has called an *effective strategy.* An effective strategy is a pattern or stream of actions that analyses the organisation's strengths and weaknesses as well as its opportunities and threats. It assesses the organisation's resources in order to use them for best advantage and that permanently interacts and adjusts to the environment. It establishes clear goals for the long term and defines the economic and non-economic objectives that generate value for stakeholders. An effective strategy is coherent, consistent, and cohesive. It integrates and unifies the entire organisation to ensure its continuity. It is a shared system of values. It is unique and different and it is difficult to copy by counterparts. An effective strategy generates or sustains competitive advantages in the market- product/service domain. It focuses on the assessment and management of risk and is flexible and adaptable to the changing environment with which is in constant interaction.

Strategy should be understood as an interactive and complex approach to combining resources and activities that mobilise the entire organisation. Individual resources and activities do not generate organisational added value, only synergistic combination of resources and activities can sustain competitive advantage. According to Porter (1996) an organisation's competitive advantages arise from the way that its activities fit with and reinforce one another. The fit should comprise of consistency, re-enforcement of activities and "optimisation to effort" which means co-ordination and information exchange across activities. Fit locks out imitators by creating a chain that is as strong as its strongest link. Strategy is a result of a complex and intricate system of interrelationships where the whole system is more important than the individual parts that constitute it. As Porter (1996:74) said: "when activities complement one another, rivals will get little benefit from imitation unless they successfully match the whole system." As each single activity is important for the organisation's success, it is very difficult to understand which factors are the most effective to

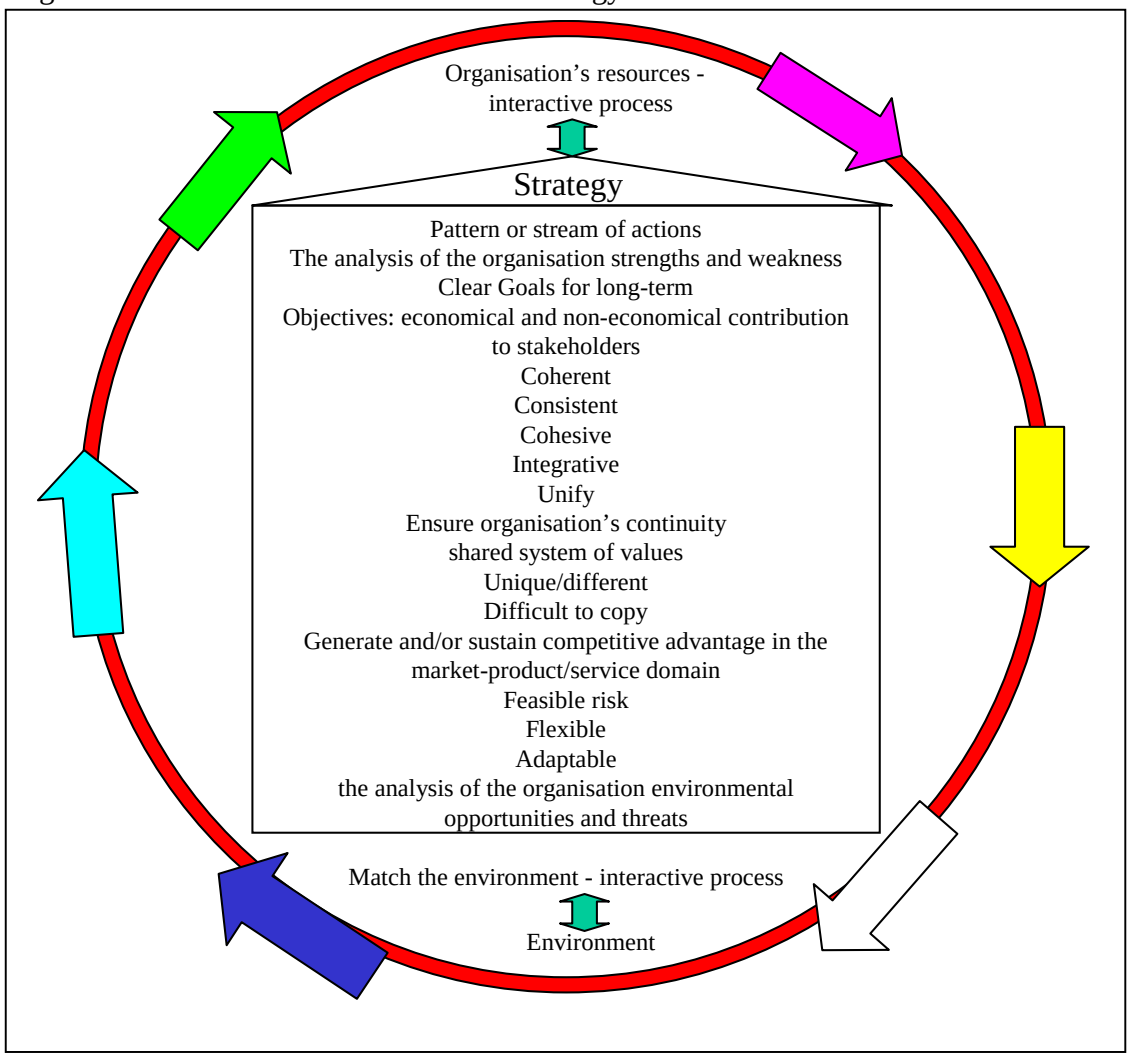
achieve organisational competitiveness. As Kay (1995:161) says, “copycat strategies fail because the potential copier cannot easily identify what is necessary to copy.” Additionally, key competitive factors such as organisation’s culture and knowledge are very difficult to describe and measure as they are the intangible key competitive factors and therefore hard to imitate. As a complex network of interrelationships, strategy becomes inaccessible to imitators (for fuller discussion of these issues see appendix 1E and Table 1Ea).

Based on the above analysis a definition of the term strategy has been developed. Strategy can be understood as:

a) the pattern of decisions that secures the organisation’s continuity,
b) the permanent interaction with and adjustment of the organisation to its environment, and
c) the actions that generate or sustain competitive advantages in the market-product domain through the creation of value that satisfies stakeholders.

Having gained insights into the concept “business strategy”, it is important to identify which strategic factors contribute for the creation and sustainability of the organisation’s competitive advantage. The next section explores the literature on the key competitive factors that may create or sustain organisational competitive advantage.

Figure 3 - Characteristics of an effective strategy



2.2. Business strategy, key strategic competitive factors - a base for sustainable competitive advantage

The process of strategy development results in an interactive process between the organisation and its external environment. In this context, competitive advantage has been associated with the organisation resources and the development of internal competences (i.e. technology, a skilled workforce, markets-products and/or services and the analysis of the

organisation's external environment comprising its customers, competitors, suppliers and environmental trends). The key organisational competitive factors are discussed below.

2.2.1. Business strategy - the key organisational competitive factors

2.2.1.1. Strategy is the effective use of technology - a base for sustainable competitive advantage

The organisational capacity for innovation has been seen as the key for organisations' sustainable competitiveness and survival. Innovation may be associated with new processes, new organisational management or new products or services but it has frequently been associated with technology developments and acquisition. As Porter (1996:75) said, "managers chase every new technology for its own sake." A vast amount of research shows that organisations frequently "fail because they do not adopt or are too late in adopting new technologies" (Joynt, 1991:84) and firms that invest heavily in technology have been shown to generate and sustain competitiveness. Thompson (1967) identified three technology categories: (1) assembly line; (2) service, and (3) intensive technology. He asserted that organisations might combine all three categories with one emerging as predominant in what he called the "core technology." He defined (1) assembly line technology, as the technology executed on materials (e.g. manufacturing industry); (2) service technology as comprising people, information or capital (e.g. the technology used by travel agencies, airlines, or building societies); and (3) intensive technology he defined as involving interdisciplinary teams (e.g. research laboratory, or intensive care in a hospitals). A broader perspective is provided by Joynt (1991) who saw technology as critical to reducing the time between the development of an idea for a product or a service and its implementation in the market place.

The development of systems to integrate the entire organisation as a means of improving the alignment of activity behind business strategy has been receiving great attention lately. Indeed, Wiseman (1985:7) saw information systems as being essential "to support or shape the competitive strategy of the organisation". Integrated systems can provide information about everything that happens in the organisation, e.g. whether it is possible to accept another

order; whether there is a delay on the production process; when the order can be delivery; when customers can be invoiced, etc. As Quinn, et al. (1996: 79) said: "Software provides a common language database for communications, captures critical data about external environments, helps players find knowledge sources, allows interactive sharing and problem solving.... [it permits] interconnection almost anywhere." Such interactive and integrative systems are a very important tool for organisational management as they permit information to flow and to increase the participation of everyone in all aspects of the business. Technological developments such as the World Wide Web, voice-mail, video-conferencing, and more recently videoconferences with 3D are invaluable for organisations to reach the frontier of competitiveness. They shorten distances, make communications easier, quicker and cheaper and allow firms to become more sensitive to their environment and the actions of their competitors.

Technology is a fundamental instrument in the implementation of information and communication networks. Technology is important because stimulates knowledge exchange, and the development of know-how. Technological systems allow communication with suppliers, customers, and skilled employees linking up the entire organisation. With the proper software, professionals can analyse data and make decisions easier. Quinn, et al. (1996: 77) emphasised the importance of the use of systems and stressed that it "captures and distributes to professionals all the knowledge that the company has built up over time. They went on to add that the "knowledge includes information about customers, professional databases, analytical models, successful solutions to problems, and access to specialised sources of knowledge". Technological developments allow shortening delivery times, increasing quality and achieving cost competitiveness, in other words to reach organisational competitiveness Hayes, (1985). These aspects are discussed below.

Delivery time

Time is a key strategic factor in achieving competitiveness (Stalk, 1988). The organisation's aim is to identify market opportunities quickly. If firms adopt new technology this might

allow them to develop new products or services faster than their competitors (Leavy, 1996; Joynt, 1991). Organisations that make their products and services available in the marketplace sooner than their counterparts attract customers first. Technological competitiveness is no longer centred on the production costs but is about implementing the technology that allows the organisation to introduce new products into the market faster than competitors. Implementing technology is a determining factor for sustainable competitiveness (Joynt, 1991).

Quality

Technology is a key important element in reaching high levels of quality. Quality was first associated with the cost of not making the product or doing the service well (e.g. defects, product failures, repairs and extra labour to rework - see Juran, 1951). The concept evolved, and was named "total quality control" (TQC), quality became understood as the interaction of functional activities e.g. engineering, purchasing, and manufacturing, to produce the product that leaves and keeps the customer satisfied (Feigenbaum, 1991). Any acceptable quality standard was also understood as "zero defects" and in the 1980s quality became strongly associated with "Japanese" business practices. Quality as defended by Garvin (1987) needs to be understood according to customers' needs and preferences rather than focused on the control of the production process. Garvin (1987) advanced eight quality dimensions that help to frame the concept. The quality dimensions need to be adjusted to the firm's targeted customers according to their requirements and priorities. Quality needs to be understood in terms of the customer's quality value perspective. The lack of quality in products or services is costly because it involves extra time, rework, warranties, legal fees, and lastly the loss of the customer. As suggested by Burt, (1989), poor quality is expensive.

Price

Cost efficiency can be accomplished trough technological development. Technology helps managers to control processes and systems and therefore to reduce costs. Consequently,

products or services can be produced and put into the market at competitive prices. It has been emphasised that technology may increase competitiveness but technical supremacy is not always decisive (Leavy, 1996, Atkins, 1994) and the acquisition of leading-edge technology is not synonymous with creating organisational value for three reasons: (i) technology is relatively accessible to all those that wish to acquire it and consequently it is difficult to do things that other people cannot copy, though access to technology is often determined by firm's access to capital; (ii) organisations need to have a skilled workforce that can use technology inventively and effectively; and (iii) the technology must be effectively deployed for the creation of value which depends of the context in which technology is being used.

Technology should be adapted and improved according to the organisation's needs and resources. As Applegate et al, (1988:136) stated, "Technology will not be an easy solution to serious problems and it won't guarantee competitiveness. As always, it requires thoughtful planning and responsible management. But as never before, it will tax the creative powers of the business leaders who must decide when to use it - and to what end." It has been acknowledged that owning the technology is not a sufficient factor to achieve organisational competitiveness. Having a knowledgeable workforce to work with the technology is essential to generate added value. Skilled and knowledgeable workforce is a key factor in the creation of competitive advantage.

2.2.1.2. Strategy is skilled-knowledgeable workforce - a base for sustainable competitive advantage

Barker, (1996) and Sanderson, (1998) argued that competitive advantage is based on intellectual power rather than resource power. Perhaps Bill Gates personifies this view: in a recent statement he said, "competitiveness is based on "cleverness" rather than "scales" (Rebello et al. 1993:51). Whatever the resources used by managers to define strategy, strategy is only possible with people and the deployment of their knowledge. As Henderson (1989:140) stated: "Imagination and logic make strategy possible". Intelligence and a capacity to learn are integral to competitiveness and therefore a knowledgeable workforce is a

key element to accomplish competitiveness. Workforce training is one way to provide knowledgeable workforce. As managers recognise the importance of knowledge and the way it increases the organisation performance, training has became a key element in the organisation strategy development.

Sharing knowledge with others allows points of confrontation and the emergence of new solutions; it adds value. Companies that exchange knowledge between customers, suppliers and experts and learn from that, enhance their competitive advantage. Knowledge is about the organisation's ability to learn (Petrash, 1996). Knowledge enhances competitiveness in a way that cannot be easily copy by competition (Seemann, 1996). Knowledge is difficult to copy because it is derived from the whole organisation that is an interactive, integrative and complex system in which all activities are inextricably linked (Porter, 1996). Technological systems, procedures, structure, and organisation culture are key elements for leveraging collective knowledge (Seemann, 1996). In these cases, competitors can only succeed if can copy the whole organisation. Established knowledge-based organisations are prepared to answer quicker to new challenges and thus they are ahead of the competition. As Quinn et al (1996:75) emphasised "Once a company gains a knowledge-based competitive edge, it becomes ever easier for it to maintain its lead and ever harder for its competitors to catch up". Knowledge creates the organisational outputs (differentiated, high value products or/and services) that generate competitive advantage.

2.2.1.3. Strategy is the organisations' domain: markets - products and /or services - a base for sustainable competitive advantage.

Various researchers have stressed the importance of the development of new products to achieve organisational competitiveness (Wheelwright and Sasser, 1989; Kerin et al, 1990). Products are the result of a combination of resources within the company i.e. the mixture of creativity and technology into a specific configuration of product, price, market position and distribution channels (Dougherty, 1992). Consequently, a distinctive competence of firms will be their ability to catalyse this "mixing" process. In order to achieve organisational competitiveness firms must also to focus their production and/or commercialisation on a

restricted number of products and/or services. Essentially, organisations must specialise and select a specific market segment. Competing in a limited number of segments refines organisational expertise through experience and learning and helps firms generate competitive advantages. Firms that do not differentiate are unlikely to gain competitive advantage in any of the product or service offered. This lends weight to Porter's (1996) assertion that firms should only compete in those segments in which they are able to do well. Porter suggests that firms should withdraw from those areas in which they are unable to do well. Consequently, strategy is not only about deciding what to do but also about deciding what not to do.

In deciding what to do, firms must differentiate themselves from their competitors. They must create products and/or services that are different. Differentiation can be defined as any significant basis that distinguishes the products and/or services of organisations. Creating and sustaining competitive advantages through differentiation can involve a number of actions. For example, the development of services that can be offered in conjunction with the product (product augmentation) is seen as essential for achieving competitiveness and maintaining customers (Quinn and Humble, 1993). While products are relatively easy to copy, the supporting services may require complex support systems with a high knowledge content and are thus more difficult to imitate. According to Blois, (1991) differentiation by product augmentation only produces an effect if: (1) customers perceive and prefer your product to competitors (Mintzberg, 1989 and Kay, 1995); (2) The organisation could charge more for the product by adding value to the product, and (3) The product augmentation is difficult for competitors to imitate (Dougherty, 1992). Otherwise it does not generate any base for differentiation or competitiveness.

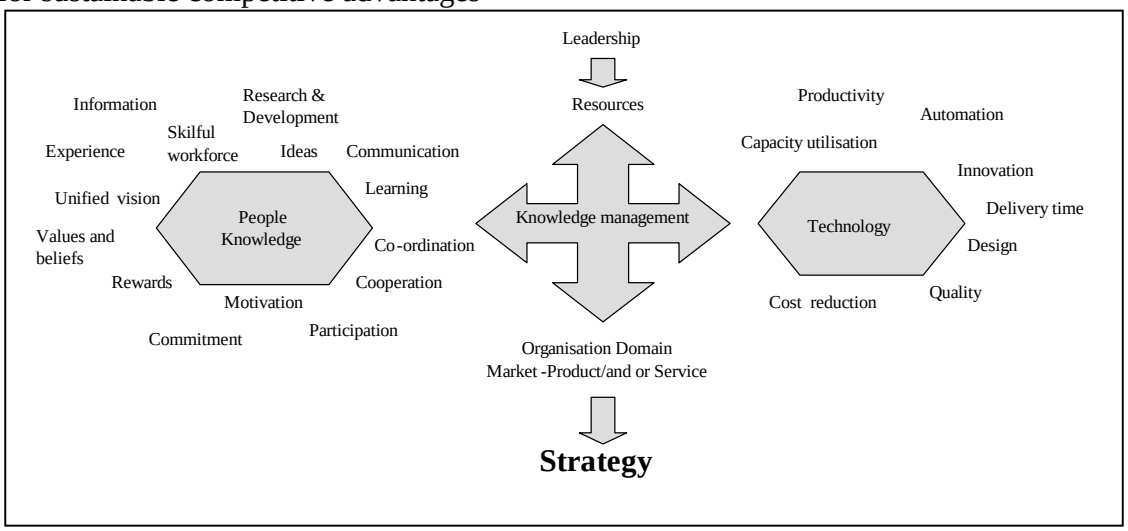
2.2.1.4. Developing a framework for the analysis of the organisation's resources and internal competencies towards sustainable competitive advantage

In order to summarise the key strategic elements that constitute competitiveness, a framework was developed (see Figure 4). The framework distinguishes three main components: people-knowdege, technolgy and knowledge management. In order to create value firms need to

have skilled people: skilled people that are willing to share knowledge and experience, that innovate, that learn and that are totally involved in making a contribution to the organisation (Drucker, 1988). A contribution is achieved through a shared system of values and beliefs, communication, participation, cooperation, information, co-ordination, motivation and rewarded systems. As Quinn, et al. (1996: 78) stated, "People are willing to share knowledge and co-operate because of their compensation. Compensation is a major motivating factor." Personnel can easily move from one company to another, so it is necessary to motivate, reward and retain skilled employees. According to Applegate, et al. (1988:129) "every time an employee goes to another company, a little bit of corporate history and experience walks out the door". Technology is another important element in the creation of organisational competitiveness. It allows communication and sharing information. Technology also contributes to the value adding process by reducing costs, increasing quality, reducing delivery times and increasing the productivity. The organisation must be seen as an entire system where activities and people are inextricably linked and where all the organisation's resources (as identified in Figure 4) are mobilised towards the development of strategies that will create value for customers.

While some systems have a capacity for self-organisation, it is argued that, particularly in SMEs, leadership is a key element that will facilitate the mixture of the organisation's resources and catalyse strategy within the firm. As Porter (1996:77) stressed, leadership is "the core of strategy." Top managers make the strategic choices; they choose the products and/or services, the markets and the customers to target. They define the organisation's boundaries and the development of the sense of unity and shared values. Managers' beliefs, values, aspirations, backgrounds, experiences, and perceptions have a major influence in the strategic orientation of firms (see Selznick, 1957; Burns, 1978). Several authors have analysed the impact of leadership on strategic orientation (March and Simon, 1958; Cyert and March, 1963; Slater, 1989; and Thomas and Ramaswamy, 1996) and other have examined the impact of leadership styles on organisational performance (Day and Lord, 1988; Gupta and Govindarajan, 1984; Miller et al., 1982; and Norburn and Birley, 1988). Managerial attributes drive strategy formulation and implementation.

Figure 4 - Strategy conceptual framework - the organisation key competitive factors a base for sustainable competitive advantages



The organisation must be seen as a whole system in constant interaction with its external environment. Key competitive factors of the organisations' external environment that sustain competitiveness are explored in the following section.

2.2.2. Business strategy - key competitive factors of the organisation's external environment

The purpose of this section is to analyse literature on the key strategic factors of the organisations' external environment that create or sustain competitive advantages. Related to the organisation's external environment, strategy integrates and relates to customers, competitors, suppliers and environmental trends. These issues are discussed below.

2.2.2.1. Strategy is the creation of customer value - a base for sustainable competitive advantage

The purpose of business strategy is to create a customer base (Drucker, 1954) and, accordingly, strategy must be focused on customers (Albrecht, 1993). Customers are the heart and the meaning of the organisation and Ohmae (1982) states that "customer-based strategies are the basis of all strategy" (1982:109). Peters (1987) and Kanter (1989) have developed

concepts that highlight organisational customer orientation. Peters (1987) developed the concept of "total customer's responsiveness" (for further details see appendix 1F) and he emphasised the collaborative, innovative and flexible aspects of a customer focused organisation. Kanter (1989) has advanced the notion of the "customer driven" organisation in which she argues that organisations should learn how to think like customers, be entrepreneurial, learning orientated, focused on core-skills and willing to incorporate new knowledge. Strategy is about serving customer's needs and continuously creating and delivering value to them (Ohmae, 1988).

Creating customer's value, requires a deep understanding of what customers really want and understanding what features they would like to see in products or services that may increase their degree of satisfaction. To be able to understand customers' needs, it is necessary to establish a close and collaborative relationship with them (Shapiro, 1988; Peters and Waterman, 1982). Regular information about customers' preferences and needs allows the organisation to define and continually redefine their strategy. According to Flores (1993), listening to customers is more than looking at their needs and what they want, it is considering their moods, predispositions, culture and background, their problems and opportunities, now and in the future. Listening is more than traditional market research, it is about trying to understand what is unsaid, it is about understanding the customer and trying to understand what features have defined their world view. Listening to customers is an essential tool that helps organisations to explore the products and services that will produce the best value. Listening to customers in this way will often require establishing formal relationships and this concept has recently added the marketing literature with considerable emphasis now being place on "relationship marketing".

The selection of an organisation's customers involves the analysis of all the factors that influence the customer's purchase decision (Porter, 1980). Different customers have different perceptions of value, needs and wishes and an effective segmentation should analyse those differences. The choice of customers is a critical strategic factor. The selection of particular customers defines the way in which organisations are going to generate value for the targeted

group. Customers should be targeted according to the organisation's goals and capabilities. Firms that match their capabilities to the customers' needs are better positioned to serve their customers than their competitors: "a happy customer tends to be a loyal customer".

The goal is capture new customers and to secure customer loyalty, because new customers are costly and generate less profit than loyal ones (Reichheld, 1996). Reichheld (1996:57) states that "In general, the longer a customer stays with a company, the more that customer is worth. Long-term customers buy more, take less of a company's time, are less sensitive to price, and bring in new customers. Best of all, they have no acquisition or start-up costs". Customer loyalty is achieved through value creation. Reichheld (1996) also argues that some businesses fail because they are focused on their own profit rather than value creation for the customer. Value creation should be valuable for customers and should be difficult to imitate by counterparts (see Grant 1991a; Porter, 1996).

Customers are not the only external environmental factor to be considered in the process of strategy development. The analysis of the organisation's competitors is also important. As Mathur and Kenyon (1997:456) pointed out "to choose a competitive strategy is to select the customers and the competitors we intend to face". The analysis of the organisation's competitors is a significant element in the formulation of strategic direction and therefore the sustainability of competitive advantage.

2.2.2.2. Strategy is understanding the organisation's competition - a base for sustainable competitive advantage

Strategy must also be defined in terms of the organisations' competition. As Porter (1980: 47) suggested, "competitive strategy involves positioning a business to maximise the value of the capabilities that distinguish it from its competitors". In order to understand business strategy development, it is important to analyse competition. The understanding of the competitors' strategic behaviour allows the organisation to formulate their strategy, avoiding conflict with the competitors' strategy and therefore retaliation. Being in the wrong war, with the wrong enemy at the wrong time, is losing a war without having the chance to start the battle. The

organisation's strategic aim is not to evaluate what the competitors are doing, but to assess what the organisation can do better than the competition. The objective is to do things differently in order to meet customers' needs. Creating value for customers is a way to avoid competition (Ohmae, 1988). Competitor analysis will allow firms to develop an understanding of what constitutes their basis for differentiation and consequently what will drive their organisational performance. Competitors may differentiate themselves through technology expertise, product, quality, design, customer service or organisational image. The search for areas of differentiation between competitors and the organisation allows entrepreneurs to reflect on which areas need to be developed or improved.

The analysis of competitors' strategic behaviour requires a considerable amount of data. Data about competitors is difficult to gather and not all firms are aware of the need to undertake effective competitor analysis or are committed to doing it or have the ability to do it. Some competitor information may be obtained from public reports, the business press, the sales force, customers and suppliers that are mutual to competitors, observation of competitors' products, staff that left competitors or market research firms (Porter, 1980). Information about competitors' strategic behaviour, even if it is intuitive, is important for the development of strategy. It could be useful in forecasting and in anticipating competitors' strategic movements. As Porter (1980:48) said " many companies do not collect information about competitors in a systematic fashion, but act on the basis of informal impressions, conjectures, and intuition gained through the tidbits of information about competitors every manager continually receives.... most companies develop at least an intuitive sense for their competitors' current strategies and their strengths and weaknesses". This notion has recently become encapsulated in the literature of strategic groups operating as cognitive communities (Porac and Thomas, 1994).

2.2.2.3. Strategy is the analysis of organisation's suppliers - a base for sustainable competitive advantage

Suppliers also play an important part in the creation of organisational competitiveness. A close collaboration with the organisation's suppliers enables the organisation to develop

formal and informal networks that will yield added value (e.g. through communication to generate information to refine products and research leading to product development, reduced costs and reduced time to market).

Suppliers can be an important part of the strategy development process. As the environment changes, suppliers are forced to change and to adapt to a new, more aggressive and dynamic reality and supply chains may often have to be re-designed and redefined. Organisations may cut down their number of suppliers (e.g. Xerox have reduced from 5000 suppliers to 400; Ford have reduced from 3200 suppliers to 2100, see Burt, 1989). Large organisations are reducing the number of suppliers and simultaneously placing higher quality standards on their suppliers in the form of open book relationships. Larger firms are essentially trying to reduce their costs by limiting their number of suppliers: too many suppliers generate heavy costs due to control systems needed and operational problems arising from the need to integrate production management across firm boundaries. Organisations prefer fewer, smaller, smarter and long term relationships with suppliers (Burt, 1989). Organisations tend to keep those suppliers that have proven themselves in the past because there are often heavy costs involved when firms decide to change their suppliers (Porter, 1980). Suppliers that were previously selected on the basis of low price and quality (which was defined in terms of the number of acceptable defect pieces), are now replaced by those that are totally committed in increasing their buyers' added value.

The commitment of suppliers is necessary to ensure a mutual lasting value. Business organisational-suppliers relationships are about the creation of new value together. The establishment of close relationships with suppliers demands responsibility, commitment, collaboration, constantly communication and feedback, shared information, learning, trust, interdependency, interpersonal connections, and respect for the achievement of mutually beneficial results. Learning is a key element for this collaborative advantage. Firms become stronger because they learn from each other. Learning and sharing knowledge towards the creation of value is of paramount importance in the development of relationships between purchasers and suppliers. Clearly, of strategic importance here is the need for firms

(particularly SMEs who may be supplying large firms in complex supply chains) to consider how they wish to position themselves in these complex patterns of inter-firm relations. While firms may form a distinctive competitive advantage by being intelligently positioned in this complex web of relations, this will have major implications for them in terms of technology deployment (as many large suppliers will require them to use certain technologies such as Computer Aided Design-CAD) and quality (as many large firms will rigidly specify compliance to certain quality norms). Collaborative supplier-customer relationships are common within the automobile industry. Nissan and Honda, for example, have radically cut down their number of suppliers but have simultaneously placed much higher quality and technology expectations on this more limited number of suppliers and have expected firms to have a higher involvement in the specifications of their design and engineering components (Rodrigues, 1997).

2.2.2.4. Strategy is the organisation's environmental trend analysis (Economic, political, sociological, technological, and ecological) - a base for sustainable competitive advantage

The choice of a suitable strategy starts with the identification of opportunities and risks in the organisation's environment (Andrews, 1980). The organisations' strategic behaviour is driven by what the environment allows and encourages (Ohmae, 1989). Environmental characteristics and changes determine the organisations' strategies, and vice versa. The analysis of the organisation's external conditions (such as economical, political, technological, sociological and ecological) affects and determines the organisations' current and future strategic direction (Andrews, 1980, Farnham, 1995): they create and limit products, services or market opportunities and they shape the organisations' competitive advantages and competition (Sanderson, 1998).

2.2.2.5. Towards and integrated framework - the organisation's resources and competences and its external environment

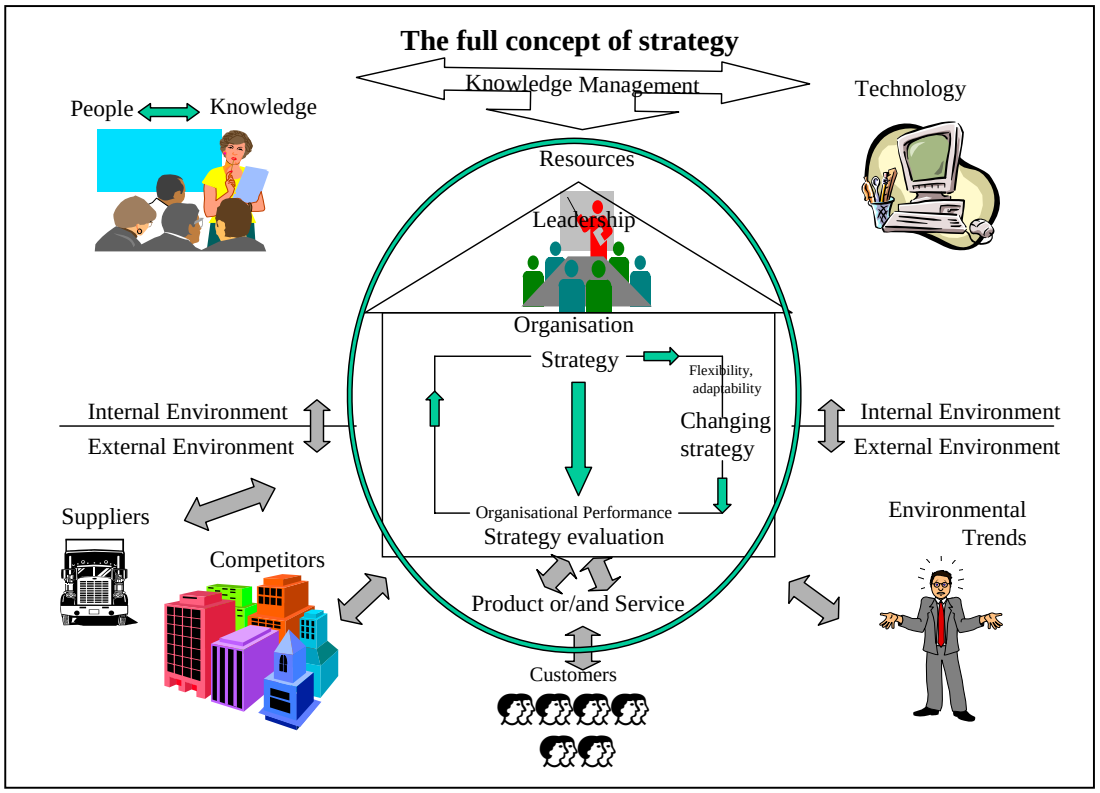
The process of strategy development and the generation of competitiveness is based on the above mentioned key factors. Those key factors have been individually analysed and,

although all of then are an important part of strategy development (Rodrigues, 2001). Few researchers have attempted to develop a framework for analysing strategy that attempts to integrate these dimensions into one holistic framework. Many researchers have neglected business strategy as a complete, integrative and interactive system looking at the interplay of many factors and their effect on how organisations mediate their relationship with their environment.

Successful strategies are those that combine all these elements in an interactive and interrelated system. The ability to develop and sustain collaborative relationships amongst all the parts with which the organisation interacts gives firms a competitive leverage. Consequently, a conceptual framework (see Figure 5) has been developed to illustrate the holistic perspective of business strategy development, i.e. it involves the entire organisation in an interactive process of inter-relationships between the organisation and its external environment.

Within the organisation's internal environment the framework emphasises technology, people-knowledge, and leadership elements that merge into another element – the knowledge management. The knowledge management integrates and unifies the entire organisation. The organisation's external environment involves the analysis of organisation's suppliers, competitors, customers and environmental trends. The interaction between the organisation and its external environment results in the definition of their products and/ or services. As the organisation is in continuous interaction with its environment, strategy needs to be constantly evaluated (see Figure 7 - Organisational performance, strategy evaluation page: 86). In response to environmental changes, firms may decide to change their strategy, or just further extend it.

Figure 5 - The holistic perspective of business strategy



The reviewed literature has helped develop an the understanding of business strategy and in identifying the key strategic factors that contribute for business strategy development that create or sustain competitiveness. The framework above provides the context for the design of a data collection and analysis process and was highly instrumental in the design of the questionnaire used in the research.

Another aim of the research was to understand how business strategy evolves over time as organisations are subject to continual environmental change and strategies must change if firms are to remain responsive to changes in their operating environment: as the environmental shifts, so must strategy. Therefore, the literature on the dynamic of strategy was reviewed and it is discussed below.

2.3. The dynamics of strategy and strategic change

This section reviews the literature on strategic change and the dynamics of strategy. As suggested by Pettigrew (1985, 1988) organisational change is considered to be highly context-dependent and most researchers see business strategy development as a necessary response to environmental shifts (see Burns and Stalker, 1966, Lawrence and Lorsch, 1986, Galbraith 1973, Thompson, 1967 and Child, 1972). Strategy is viewed as a device whereby firms mediate their relationship with their environment. Arguably, if firms are capable of enacting this mediation process successfully, then they should perform relatively well (see Dess and Davis, 1984, Hambrick, 1983, 1983c, 1985, Hatten, Schendel and Cooper, 1978, Miller and Friesen, 1986a, 1986b). Environmental shifts may lead organisations to change strategies and changing strategy should enable organisations to sustain competitiveness (Rodrigues, 2002). Here we argue that there is a complex relationship between the firm's external environment, its current strategy, the strategic stance a firm adopts, the way it modifies its strategy and the way the business performs: understanding this complex dynamic is, in essence, the focal point of this research.

Some researchers questioned whether organisations are likely to adapt to their environments (see Aldrich, 1979, Child, 1972) and others have seen firms as conservative and resistant to change (see Carter, 1971, Cyert and March, 1992, and March and Simon, 1958). Other researchers have argued that strategies appear to endure over time, as strategic change is difficult and costly (Miller, 1982). March (1981) suggests that organisations do respond to their environment but in a steady and continuous way as they think that neither success nor change requires dramatic action. Change is often seen as occurring within a sequenced routine of standard procedures or as the result of the impact of random events.

Despite there being a large body of literature in favour of the stasis view of strategy, the way firms evolve over time indicates that the most successful firms have relatively long periods of convergence and incremental change (geared to increasing the "alignment" between strategy, structure, people, culture, systems, processes and procedures). These periods of incremental change are punctuated by brief periods of upheaval, discontinuous, revolutionary or frame-breaking changes (geared to reshaping the entire organisation, involving shifts in strategy,

structure, people, culture, systems processes and procedures - see Tushman, Newman and Romanelli (1986); Tushman and O'Reilly III (1996)).

Change can be seen both as a continuous process (March, 1981) as well as a discontinuous process involving radical change episodes interspersed with long periods of stability and inertia (Miller and Friesen, 1984). Consequently, we may argue that successful firms are those that maintain a workable equilibrium for several years but they are also able to initiate rapid change when their environments shift (Tushman, Newman and Romanelli, 1986). As suggested by Tushman, and O'Reilly III, (1996) successful firms are those that can manage and pursue both incremental and discontinuous change (for further details see appendix 1G1).

Therefore, different models of change can be distinguished (Tushman, Newman and Romanelli, 1986, Meyer, Brooks, and Goes, 1990): these are first order change involving continuous, convergent, incremental or evolutionary change; and, b) second order change involving discontinuous, upheaval, frame-breaking or revolutionary change.

The first and second order changes have been subject of analysis:

- variation vs. reorientations in products (Normann, 1971),
- adaptation vs. metamorphosis in organisations (Miller and Friesen, 1984),
- competence-enhancing vs. competence-destroying changes in technology (Tushman and Anderson, 1986) and
- evolution vs. revolution in industries (Schumpeter, 1950).

However, first order change has received greater attention than second order change (Zamuuto and Cameron, 1985, Ginsberg, 1988). According to Tushman, Newman and Romanelli, (1986:37) "Frame-breaking changes are revolutionary changes *of* the system as opposed to incremental changes *in* the system".

Continuous, convergence, incremental change often serves to reinforce the existing strategy of firms as existing structures, processes, systems and cultures are reinforced over time. The organisation develops consistencies that are strengthened, leading to an interconnected and stable system that remains unchanged. Firms may ignore environmental threats or may recognise them but respond by emphasising and improving what they are currently doing. In the convergent change model, the initial reasons for success may become those that trigger failure if environments change radically (Tushman, Newman and Romanelli, 1986).

Discontinuous changes are often rapid and often distressing for businesses: they often meet with resistance (e.g. structural and cultural inertia as firms think that their recipes for success in the past are continually valid - see appendix 1G2 for further details). Discontinuous changes occur in reaction to, or in anticipation of, environmental changes. These changes often that entail more than incremental adjustments and usually require fundamental systemic change (Tushman, Newman and Romanelli, 1986, Meyer, Brooks, and Goes, 1990).

As suggested by Goodstein and Burke (1991), frame breaking changes may be a result of significant economical, political, sociological, technological and legal changes. For example, there may be industrial/structural change that affect the whole base of competition or there may be product life cycle shifts in which the base of competition is changed (see appendix 1G3) or there may be changes internal to the company (for example, a change in ownership or the succession of ownership from one generation to the next - an issue of some importance in SMEs). Discontinuous change may involve a reorientation of the entire organisation (e.g. a change of mission and core values), new leaders with different management styles or power shifts in the organisation (e.g. from a production orientation to a marketing orientation). When frame-breaking change is necessary, there is a view that change should be implemented rapidly.

Frame-breaking changes are almost always driven either by organisational performance problems or by shifts in the organisation's environment. Organisations tend to change because of external pressure rather than an internal desire or need to change (Goodstein and

Burke, 1991). If an environment is stable, it is possible for an organisation to evolve slowly through continuous incremental change. However, if the environment shifts, second order changes is often required. Managers who try to adapt to major discontinuities by making incremental adjustments have been found to have a low probability of success (Tushman, and O'Reilly, 1996).

Competent organisations are those that understand early signs of external shifts and make the appropriated adjustments that may lessen the impact of more radical changes. However, most firms only initiate drastic changes when there is a continued performance decline. Only very few firms have been found to initiate changes prior to the experience performance decline. Firms that anticipate environmental changes and proactively initiate and implement effectively frame-breaking change gain time to plan their alterations (Tushman, Newman and Romanelli, 1986). Again, given the focus of this research, the objective is to explore how firms do react to their changing environment and to explore how this ability to change is affected by the strategic positioning of firms and how this ability to change is manifest in terms of the performance of the business. The dynamics of strategy in turbulent environments has been studied by researchers such as D'Aveni (1995), Ghemawhat (1991), and Chakravarthy, (1997). The objective here is build on this research in the context of the Portuguese Mould Industry.

Meyer, Brooks, and Goes, (1990) organised the literature on organisational change (theories about how firms maintain alignment with their environments), according to the implicit and explicit assumptions about its mode (as seen, continuous vs. discontinuous) and its level (firm vs. industry, see Astley and Van de Ven, 1983). They presented four basic types of organisational change: adaptation, metamorphosis, evolution and revolution (see, Figure 6 - Models of change within organisations and industries).

Figure 6 - Models of change within organisations and industries

	First-Order Change	Second-Order Change
Firm Level	**Adaptation**	**Metamorphosis**
	Focus: Incremental change within organisations Mechanisms: • Incrementalism • Resource dependence Authors: Miles and Snow (1978) Pfeffer & Salancik (1978) Quinn (1980)	Focus: Frame-breaking change within organisations Mechanisms: • Life cycle stages • Configuration transitions Authors: Ginsberg (1988) Greiner (1972) Kimberly & Miles (1980) Miler & Friesen (1984) Tushman & Romanelli (1985)
Industry level	**Evolution**	**Revolution**
	Focus: Incremental change within established industries Mechanisms: • Natural Selection • Institutional isomorphism Authors: Hannan & Freeman (1977, 1984) McKelvey & Aldrich (1983) DiMaggio & Powell (1983) Scott (1987) Zucker (1987)	Focus: Emergence, transformation and decline of industries Mechanisms: • Punctuated equilibrium • Quantum specialisation Authors: Astley (1985) Barney (1986) Gould & Eldredge (1977) Schumpeter (1950)

Source: Meyer, Brooks, and Goes, (1990:96)

Theories of first-order change constructed at the firm level analysis were designated as *adaptation theories*. Adaptation theories mean that firms intentionally and continuously adapt and adjust to their environments. Incrementalism (see Quinn, 1980; Miles and Snow 1978; Mintzberg and McHugh, 1985) and resource dependence (see Pfeffer and Salancik, 1978) are the two mechanisms of change integral to adaptation theory. The incrementalist approach suggests that strategists experiment with new products, structures and processes and those that succeed are selected and institutionalised in the structural design of the organisation and in the building of new product-market domains. The resource dependence approach understands that organisational changes are responses imposed by external dependencies rather than being determined by the strategist. However, whichever approach is taken, the theoretical explanation is limited to small adjustments and incremental changes within firms.

Theories of first-order change constructed at the industry level of analysis were designated as *evolution theories* (i.e. populations of firms that are pushed towards the alignment with

established external conditions). There are two mechanisms of change of the evolutionary theory: the population ecology (see Hannan and Freeman, 1977, 1984, McKelvey, and Aldrich, 1983) and institutional isomorphism (see Meyer and Rowan, 1977; Scott, 1987; Zucker, 1987). Of most importance here is the "population ecology" mechanism, which emphasises competition and selection, as populations evolve gradually to fit environmental constrains. Competition for resources moulds populations by affecting entry and exit rates. Organisations are subject to strong forces of inertia and they seldom succeeded in making radical changes in strategy and structure in the face of environmental threats. High levels of structural inertia in these groups can be explained as an outcome of an ecological-evolutionary process.

Theories of second-order change constructed at the firm level of analysis were denominated as *metamorphosis theories*. Metamorphosis theories imply that organisations undergo convergent change with periodically punctuated realignment through frame-braking changes. Theses changes occur within single firms. There are several causal mechanisms important here: changes in the organisation life cycle stages (Kimberly and Miles, 1980); change of strategic behaviour or technological innovation (Tushman and Romanelli, 1985).

Theories of second-order change constructed at the industry level of analysis were termed as *revolution theories* (see Schumpeter, 1950). Revolution theorists argue that long periods of organisational stability are broken by brief periods of radical change that restructure and reconstitute the industry. Revolutionary theories encompass two mechanisms: the punctuated equilibrium and quantum specialisation. Of most importance here is "punctuated equilibrium" which is an alternation between long periods when stable infrastructures permit only incremental adaptations and brief periods of revolutionary upheaval (Gersick, 1991). The four models of change within organisations and industries are not independent and mutually exclusive forms of change but are complementary (Meyer, Brooks, and Goes, 1990). Changes occurring at different levels can be highly interrelated, may occur simultaneously and the intensity of the change in one quadrant may influence changes in the others.

In summary, this section developed an overview of some of the most important aspects of strategic change. Given the focus of this research on exploring the relationship between business strategy, how firms change their strategy and its impact on business performance, several key points have emerged. First, there is a body of literature which implies that firms are often resistant to changing their strategies as this is costly and they have often become habituated into certain patterns of behaviour that are difficult to change. Second, given that firms are seen to mediate their relationship with their environment through their strategies, firms will engage with different patterns of behaviour. Where changes in the environment are not radical, firms will adjust their actions incrementally and will persist with incremental change while this is sustainable. Where changes is the environment are more radical, firms may have to engage with more radical forms of change within the business that will bring about discontinuous shifts in strategy, which will cause the radical reorganisation of firms and major reconfigurations in the way that firms mix their resources.

The reviewed literature on the concept of strategy, the key strategic elements for sustainable competitiveness and the dynamics of business strategy has allowed an in-depth understanding of the process of business strategy development. The analysis has enabled to identify the key strategic factors that form strategy, and therefore to contribute for the development of the research conceptual framework.

Clearly, a framework is now required that will allow the categorisation of firms' strategic behaviours in respect to their changing environments. This is the focus of the next section.

2.4. Generic strategies and strategic typologies

The purpose of this section is to review and discuss literature on pattern of categories of organisational strategic behaviour. Before analysing the generic strategies and strategic typology literature it is important to distinguish between corporate and business strategy. Corporate strategy focuses on the selection of the product-market in which a firm might wish

to compete while business strategy focuses on the way that the firm will operate and compete in each product-market (Hambrick, 1983).

According to Namiki (1989:72) “a strategic typology is a broad categorisation of firms’ strategic behaviours into a few types. It is a simplified description of strategic options available to a firm. In other words, a strategic typology represents several alternative “packages” each of which contains a required or recommended set of strategy and organisational characteristics.” These “packages” (i.e. strategy types) comprise a set of common features or routines that shape the way that organisations compete. Galbraith and Schendel (1983:156) defined a strategy type as “a consistent pattern or combination of managerial controllable or decision components representing scope, resource deployments, and competitive advantages; and the direction in which these components are shifting over time, which characterises the way business tend to compete”. Strategic typologies are important because they enable us to predict firms’ business strategy and consequently help managers in their process of decision-making.

The development of strategic typologies, leaves behind the notion that strategy is unique and seeks to identify commonalties within the strategic behaviour patterns of different organisations (Dess and Davis, 1984). Herbert and Deresky (1987) suggest that a typology of strategy is useful because its highlights essential features by separating specific strategic situations from each other and capturing their major commonalties to facilitate the study of general strategic patterns. Miller (1982:2) recognises that gestalts of this type represent “tightly integrated and mutually supportive parts, the significance of which can best be understood by making reference to the whole.” Thus the notion of strategic groups supply a useful intermediate frame of reference between viewing the industry as a whole and considering each firm separately (Porter, 1980).

The number of strategic typologies is broad and varies from author to author (see Chandler, 1962, Ansoff, 1965, Miller and Friesen, 1978, Miles and Snow, 1978, Porter, 1980, and Mintzberg, 1988). Classifications differ according to the variables used or examined by each

researcher. It depends on what his or her objectives for the firm are, and the way they are interpreting organisation business strategy. Among the various classifications the research outlines some in a chronological order (see appendix 1H). The research has selected Miles and Snow's (1978) strategic typology for the analysis. Miles and Snow's strategic typology is analysed and discussed in detail in the next section.

2.5. Miles and Snow's (1978) strategic typology

The aim of this section is to gain a comprehensive understanding of Miles and Snow's strategic typology. Therefore, the typology, empirical support, criticism, and the identification of the existing methodological and literature gap are reviewed. The Miles and Snow's typology is a simple and broad categorisation of organisational strategic behaviour at the business level. It has been viewed by researchers as the one that characterises the organisation as a complete system especially its strategic orientation (Snow and Hrebiniak, 1980). McDaniel and Kolari (1987) see it as a useful tool to analyse the relationships between an organisation and its environment. Hambrick (1983) adds that the typology accounts for significant variations across organisations and allows the "strategy construct" or the concept of strategy to be operationalised. Supporting the same point of view, Namiki, (1989) and Zahra and Pearce (1990) emphasised that it is a reasonably accurate conceptualisation of firms' strategic behaviour. Its major strengths are its parsimonious nature (which can also be a shortcoming) and its simple conceptualisation of strategy. The Miles and Snow's strategic typology concept is discussed below.

2.5.1. The Miles and Snow's concept

The typology was conceptually developed by a post-hoc identification of patterns in the product-market strategies of four industries (i.e. 16 firms from the publishing industry, 49 electronics and food processing firms and 19 hospitals). It attempts to illustrate the entire organisational system, as an integrated and dynamic interrelationship between strategy, structure, and process and environment. The typology endeavours to describe and predict the

process of organisation adaptation to the environment - *the adaptive process*. Miles and Snow (1978) developed a typology of strategic types that identified four different behavioural patterns (*Defenders, Prospectors, Analysers* and *Reactors*). The adaptive process deals constantly with three main "problems": 1) the entrepreneurial, 2) the engineering and 3) the administrative:

1) The entrepreneurial problem is concerned with the choice of the organisation's product-market domain (a specific product or service and a target market or market segment); what business the firm wants to be in (for new organisations) or what business the firm would like to be in (for existing organisations).

2) The engineering problem encompasses the organisation's technological choices for the production and distribution of products or services. This requires the development of systems including production and distribution systems and the construction of information, communication and control linkages. In sum the engineering problem deals with the selection of technology to sustain systems that co-ordinate and control internal operations.

3) The administrative problem reduces uncertainty *within* the organisational system. It entails the formulation and implementation of those processes that enable the organisation to continually evolve (innovate). It combines the selection of areas for future innovation and the rationalisation of structure and processes.

The four organisational strategic types have their own configuration of technology, structure, and process for responding to the environment. According to Miles and Snow (1978:12) "three of the four strategic types, (*Defenders, Analysers* and *Prospectors*), have their own unique, viable pattern of adaptation". These strategic types are "stable" forms of organisation (i.e. if management chooses to pursue one of these strategies and designs the organisation accordingly, then the organisation may be an effective competitor in its particular industry over a considerable period of time). The fourth strategic type – *Reactors*, is a form of organisation that occurs when management does not choose to pursue one of three "pure"

strategies. The organisation fails to align strategy, structure, and process in a consistent fashion. Reactors are "unstable." The characteristics of the four strategy types are described below:

Defenders are organisations that have a narrow product-market domain and do not tend to search outside of their domains for new opportunities. They attempt to locate and maintain a secure niche in a relatively stable product or service area by offering a more limited range of products or services than its competitors with higher quality, superior service and lower prices. As a result of this narrow focus, these organisations seldom need to make major adjustments in their technology, structure or methods of operation. Often they are not at the forefront of developments in the industry, they tend to ignore industry changes that have no direct influence on current areas of operation and concentrate instead on doing the best job possible in a limited area. They devote primary attention to improving the efficiency of their existing operations. Defender strategy type develops a process, which aligns with a particular portion of the overall environment. According to Miles and Snow (1978:47) "This adjustment process produces a unique configuration of domain, technology, and process (a limited range of products and customers, a cost-efficient technology, and a highly specialised and formalised organisation structure). Defenders seek out and coexist better within an environment of greater stability than do their counterparts within the same industry. Defenders deliberately create and maintain an environment for which a stable form of organisation is appropriate. This type of organisation is optimally designed to serve its present domain but has little capacity for locating and exploiting new areas of opportunity."

Prospectors are organisations which search almost continuously for market opportunities and they regularly experiment with potential responses to emerging environmental trends. They are the creators of change and uncertainty by focusing on product and market innovation. Marketing is seen as a crucial function in the search of new products and market opportunities. They respond rapidly to early signals concerning areas of opportunity, and these responses often lead to a new round of competitive actions. They value being "first in" to new product and market areas even if not all of these efforts prove to be highly profitable.

They typically operate within a broad product-market domain that undergoes periodic redefinition. However, they may not maintain market strength in all of the areas they enter. As Miles and Snow (1978:65) stated "prospecting is risky, and many projects simply will not be successful. Prospectors clearly misutilise more resources than the Defenders". As they have a broad product-market domain they may be technologically inefficient. According to Miles and Snow (1978:67) "A prospector cannot maximise profitability because of its inherent inefficiency." However, they are effective in that they are prepared to respond to tomorrow's world demands. Contrary to Defenders that seek out and exist within stable environments, Prospectors suit a more dynamic environment. As suggested by Miles and Snow (1978:65) " Prospectors enact an environment that is more dynamic than those of other types of organisations within the same industry. The Prospector does so by continually modifying its product-market domain to take advantage of perceived opportunities and by emphasising flexibility in its technology and administrative system in order to facilitate rapid adjustment".

Analysers are organisations, which operate in two types of product-market domains, one relatively stable and the other changing. In the stable domain, they operate routinely and efficiently through the use of formalised structures and processes. In their more turbulent domain, top managers watch their competitors closely for new ideas and then they rapidly adopt those, which appear to be the most promising. They attempt to maintain a stable, limited line of products or services while at the same time moving out quickly to follow a carefully selected set of more promising new developments in the industry. They seldom are "first in" with new products or services. However, by carefully monitoring the actions of major competitors in areas compatible with its stable product-market base, they can frequently be "second in" with a more cost-efficient product or service. According to Miles and Snow (1978:78) "balance is the common characteristic of the Analyser's solutions to the three problems of the organisational adaptation. This particular type of organisation has a combination of Prospector and Defender characteristics. The Analyser defines its entrepreneurial "problem" as how to locate and exploit new product and market opportunities while simultaneously maintaining a firm base of traditional products and customers. The

organisation solves this problem with a hybrid mix of stable and emerging products. Marketing is regarded as a particularly crucial function that must not only locate new product or market opportunities but also promote the sale of the organisation's traditional products or services. The Analyser avoids the expense of research and development choosing instead to imitate the successful actions of Prospectors. The Analyser is able to serve its product/service mix by creating a dual technological core. The stable component of the technology is a near efficient production system that is able to create products or services on a standard basis. The flexible component exists in the form of a large and influential applied research group whose function is to adapt new product designs to fit existing technological capabilities. The dual nature of the Analyser's technology allows the organisation to produce familiar products or services efficiently while keeping pace with the developments engendered by Prospectors." Miles and Snow (1978:80) continue, "the Analysers' administrative system is ideally suited to balance stability and flexibility. The Analyser's dual technological core means that the organisation can never be completely efficient nor completely effective." Therefore, Analysers seem to be the balanced strategy type.

Reactors are organisations in which top managers frequently perceive change and uncertainty occurring in their organisational environment but are unable to respond effectively. This type of organisation lacks a consistent product-market orientation with a consistent strategy-structure relationship. They are usually not as aggressive in maintaining established products and markets or take as many risks as competitors. They seldom make adjustments of any sort until forced to do so by environmental pressures. As suggested by Miles and Snow (1978:86) "stymied by its present lack of strategy, the organisation is reluctant to act in a manner that will achieve an acceptable equilibrium with its environment." They (1978:92) continue "Reactors are unstable organisations because they do not possess a set of mechanisms, which allows them to respond consistently to their environments over time. Frequently, such organisations fall into an unpleasant cycle of responding inappropriately to environmental change and uncertainty performing poorly as a result, and then being reluctant to act aggressively in the future." Reactors' organisations lack a clear and consistent strategy.

In order to synthesise the three viable strategy types' characteristics and the way they deal with the three "problems" (entrepreneurial, engineering and administrative), the following framework has been developed (see Table 1).

Table 1 - Characteristics of the three strategy types: Defenders, Prospectors, and Analysers.

	Defenders		Prospectors		Analysers	
	Problem	**Solutions**	**Problem**	**Solutions**	**Problem**	**Solutions**
Entrepreneurial "problem"	How to "seal off" a proportion of the total market to create a stable set of products and customers	1. Narrow and stable domain 2. Aggressive maintenance of domain (e.g. competitive pricing and excellent customer service) 2. Tendency to ignore developments outside of domain 4. Cautious and incremental growth market penetration 5. Some product development, but closely related to current goods or services	How to locate and exploit new product and market opportunities	1. Broad and continuously developing domain 2.Monitors wide range of environmental conditions and events 2.Creates change in the industry 4.Growth through product-market development 5.Growth may occur in spurts	How to locate and exploit new product and market opportunities while simultaneously maintaining a firm base of traditional products and customers	1.Hybrid domain that is both stable and changing 2.Surveillance mechanisms mostly limited to marketing; some research and development 2.Steady growth through market penetration and product- market development
Engineering "problem"	How to produce and distribute goods or services as efficiently as possible	1. Cost-efficient technology 2. Single core technology 2. Tendency toward vertical integration 4. Continuous improvements in technology to maintain efficiency	How to avoid long-term commitments to a single technological process	1.Flexible, prototyping technologies 2. Multiple technologies 2.Low degree of routinization and mechanisation; technology embedded in people	How to be efficient in stable portions of the domain and flexible in changing portions	1.Dual technological core (stable and flexible component) 2.Large and influential applied research group 2.Moderate degree of technical efficiency
Administrative "problem"	How to maintain strict control of the organisation in order to ensure efficiency	1.Financial and production experts most powerful members of the domain coalition; limited environmental scanning 2. Tenure of domain coalition is length; promotions from within 2.Planning is intensive, cost-orientated, and completed before action is taken. 4. Tendency toward functional structure with extensive division of labour and high degree of formalization 5. Centralised control and long-looped vertical information systems 6. Simple coordination mechanisms and conflicts resolved through hierarchical channels 7. Organisational performance measured against previous years; reward system favours production and finance.	How to facilitate and coordinate numerous and diverse operations	1.Marketing and research and development experts most powerful members of the dominant coalition 2.Dominant coalition is large, diverse, and transitory; may include an inner circle 2.Tenure of dominant coalition not always length; key managers may be hired from outside as well as promoted from within 4. Planning is board rather than intensive, problem orientated, and cannot be finalised before action is taken 5.Tendency toward product structure with low division of labour and low degree of formalisation 6.Descentralised control and short-looped horizontal information systems 7.Complex coordination mechanisms and conflict resolved through integrators 8.Organisational performance measured against important competitors; reward system favours marketing and research and development.	How to differentiate the organisation's structure and processes to accommodate both stable and dynamic areas of operation	1.Marketing and applied research most influential members of dominant coalition, followed closely by production 2.intensive planning between marketing and production concerning stable portion of domain; comprehensive planning among marketing; applied research, and product managers concerning new products and markets 2.matrix structure combining both functional divisions and product groups 4. Moderately centralised control system with vertical and horizontal feedback loops 5.Extremely complex and expensive coordination mechanisms; some conflict resolution though product managers, some through normal hierarchical channels 6.Performance appraisal based on both effectiveness measures, most rewards to marketing and applied research.

Adapted from Miles and Snow (1978:48, 67 and 79).

Miles and Snow's strategic typology has an extensive empirical support. The following section discusses research that has been conducted using the Miles and Snow framework.

2.5.2. Miles and Snow's empirical support

This section reviews evidence for validity of the Miles and Snow' typology derived from prior studies, whether in a static or dynamic viewpoint.

2.5.2.1. The static viewpoint

As a simple and broad categorisation of organisational strategic behaviour, Miles and Snow's strategic typology has been used in a wide variety of settings (e.g. manufacturing, banks, chemical, churches, colleges, civil construction, electronics, hospitals, insurance, retailing, and tobacco - see appendix 1H1, Table 1H1a). Several researchers have, in general, validated the typology in different environmental settings and others have extended the typology significantly.

Snow and Hrebiniak (1980), in a study of the plastics, semiconductors, automotives and air transportation industries, analysed the relationships between strategic type and organisational performance - an issue of key interest in this research. Their findings revealed Defenders and Prospectors to be the largest groups but, interestingly, they found larger numbers of Reactors than expected in the air transportation industry, which was an industry that was highly legislated and environment where uncertainty was perceived to be low as the industry was embedded in a stationary environment where competitive forces were dictated by government regulations.

Snow and Hrebiniak's (1980) results also demonstrated that top managers in Defender organisations consistently perceived general management, financial management, production and applied engineering to be distinctive competences while top managers in Prospector

organisations consistently perceived general management, product R&D, market research and basic engineering to be distinctive competences. According to the theory, Analysers were predicted to share the Defender's competences in production and applied engineering, and the Prospector's marketing competences. Analyser's distinctive competences were considerably less evident. Reactors, as predicted, have not shown a consistent pattern of distinctive competence.

The literature suggests that different strategies perform equally well in different environments. Snow and Hrebiniak (1980) found that different strategies performed equally well in different competitive environments but not in a highly regulated industry where Reactors outperformed all the other strategy types. Their findings show that top mangers consistently identified Defenders with manufacturing efficiency and Prospectors with product and market effectiveness. The Reactor strategy was generally associated with poor financial performance while the other three strategies were associated with varying degrees of positive performance. Defenders, Prospectors, and Analysers consistently outperformed Reactors in competitive industries but not in an industry that was highly government regulated, where Reactors outperformed all the three strategic types. However, as Snow and Hrebiniak (1980) restricted their analysis to one measure of organisational performance (i.e. profitability using Return on Assets-ROA as an operation measure), the relationship between strategy type and performance will need to be examined using a wider set of criteria. This research will attempts to validate Snow and Hrebiniak's results and also to test the relationship between strategic type and performance using a wider set of criteria.

In conclusion, Snow and Hrebiniak's (1980) findings show that top mangers perceived a variety of organisational strategies being pursued in the industry. Defenders and Prospectors pursued different strategies and had different distinctive competences and both financially succeeded. These findings are consistent with the strategic choice perspective (Child, 1972) but appear to be somewhat contrary to an ecological or natural selection model of organisational performance and survival (Hannan and Freeman, 1977). An ecological model postulates that the environment determines the most appropriate form of organisation and that

strategy or distinctive competence may be relatively inflexible to managerial manipulation. In contrast, Snow and Hrebiniak's research suggests that substantially different types of organisational strategy and distinctive competences can occur contemporaneously in the same industry environment, apparently reducing the effects of natural selection. As Stevenson (1976) showed, top managers' perceptions of distinctive competences vary considerably. Top managers make deliberate choices to develop strategies and distinctive competences, even though that the environmental demands faced by firms within the same industry may be generally similar.

Other researchers such as Hambrick (1983), and Namiki (1989) have explored the internal consistencies of the strategic typology, and the strategy types relationships with the environment and organisational performance. Hambrick (1983) explored the effectiveness of Defenders and Prospectors strategy types in different environments. He explored the ways in which they differ in their functional attributes (entrepreneurial, engineering problems and competitive devices) and the performance implications of these differences. Related to the entrepreneurial attributes, Prospector's product R&D/sales, and marketing expenses/sales competences were significantly better developed than Defenders. Prospectors were also better in allocating more resources for motivation, information and education of their sales forces and customers than Defenders that aligned their functions using largely efficiency criteria. Defenders were also more forward integrated than Prospectors. Related to the engineering attributes, Defenders had higher gross assets per employee, value added/employee, and lower direct costs than Prospectors. This supports the notion that Defenders tend to be more efficient than Prospectors. No significant differences were found between Defenders and Prospectors in backward integration, process R&D expenditures, or capacity utilisation. Among the competitive devices that encompass price, service and quality, Defenders offered better average service than Prospectors but no differences were in found in price and quality.

Contrary to Miles and Snow (1978) and Snow and Hrebiniak's (1980) assumption that all three strategy types perform equally well in a given environment, Hambrick (1983) found that significant performance differences existed between Prospectors and Defenders depending

both on the environment and on the performance measures used. Hambrick (1983) suggested, that the success of strategy types varies across different industry environments. Different strategies do not equally succeed across different environmental contexts. Some strategies are more successful than others depending on the type of environment. Yet Hambrick's cross-sectional study does not explore strategic changes over time in response to environmental changes. Therefore, there was the need to explore the notion of equally viable strategy types versus particular appropriate strategy/environmental conditions. Hambrick's study was also limited to the analysis: a) of the Defender and the Prospector's strategy types, b) the entrepreneurial and engineering dimensions and c) profitability measures (i.e. return on investment-ROI and cash flow-CFOI).

Like Hambrick (1983), Namiki (1989) examined the internal consistencies (among the entrepreneurial, engineer and administrative "problems") of the strategic typology, and explored the strategy type (Defenders, Prospectors, Analysers and Reactors) relationships with organisational performance and environment. Strong strategic typology consistency was found for Prospectors but some inconsistency was found for the Defenders' strategy type. The analysis of the relationships between strategy types and environment show that there is a strong association between strategy types and the degree of perceived environmental uncertainty. Prospectors that emphasised product-market changes tended to pursue innovative differentiation and high level of growth. Prospectors competed in a highly uncertain technological environment. Defenders competed equally well whether in certain, moderately uncertain or highly uncertain environments. Analysers tended to compete in any type of environments. Most of the Reactors perceived their technological and market environment as very certain with no need for change. On the relationship between strategy types and business performance, Prospectors in highly dynamic and changeable environments outperformed Defenders in terms of sales growth. However, the relationship between type and performance cannot be regarded as definitive as Namiki's (1989) research was limited to the use of subjective measures of organisational performance (i.e. proprietor's evaluation of the firm's performance compared with competitors).

The inconsistencies found in Namiki's (1989) results could be a result of the unique features of the semiconductor manufacture industry characterised as being in the growth stage of the industry life cycle with constant development and introduction of new products. In such a rapidly changing and expansive environment, the Prospector may be the appropriated strategy type. As Hambrick (1983) noted, Prospectors may succeed in innovative industries, which search for constantly new market-products. Namiki (1989) and Hambrick (1983) verified the notion that certain environments favour certain strategies, which contradicts Miles and Snow's (1978) and Snow and Hrebiniak's (1980) results that have shown that Prospectors, Defenders and Analysers performed equally well in any industry provided that strategy is well implemented. Overall, Namiki (1989) concluded that the typology is a reasonably accurate conceptualisation of firm's strategic behaviours.

Smith, Guthrie and Chen (1989) added to the previous studies the analysis of relationships between organisational size and performance. Hofer (1975) identified organisational size as one of the most important contingency variables that influence the relationship between strategy and performance. Smith, et al. (1989) studied Miles and Snow's strategy types and the adaptive process in their three problems, the entrepreneurial, the engineering and the administrative. They investigated the typology and its relationship between, size and performance. Analysers and Prospectors were consistent with the typology but some inconsistencies were found for the Defender strategy type. Prospectors aggressively sought growth by innovation and were managed by younger, less experienced managers with engineering backgrounds. Surprisingly, Prospectors in this research did not report having a broad market definition or flexible production systems as predicted by Miles and Snow (1978). Managers in Analyser companies had the longest tenure and backgrounds in production, engineering and marketing. Most of the Defender's dimensions were opposite to that predicted by the theory. Their results demonstrated that a firm's size can explain differences in the relationship between strategy and performance. Analysers were primarily large firms and Reactors small firms. Few differences existed between size distribution of Defenders and Prospectors. Prospectors and Defenders were smaller than Analysers and larger than Reactors.

Related to organisational performance Smith, et al.'s (1989) results show that Defenders, Analysers and Prospectors performed equally well and consistently outperformed Reactors thus corroborating Miles and Snow's (1978) and Snow and Hrebiniak's (1980)[2] findings. However, contrary to expectations, Defenders performed better as small firms and Prospectors as large firms in all the performance measures. The relationship between Analysers-size-performance was not significant. Reactors were poor performers. However, alike Namiki's (1989) research, Smith et al., (1989) restricted their performance analysis to subjective performance measures (i.e. the evaluation of the firm's performance compared with its competitors).

The findings of Smith et al., (1989) support only one part of the typology which leads to the debate of the ability of Miles and Snow's typology to accurately predict organisational behaviour. Due to the inconsistencies found in the typology, they suggest that "perhaps Miles and Snow's typology of strategy is more reflective of different stages of strategy development than strategic alternatives available to any firm" (p:79). However, they ascertained an overall validation of the typology. They suggested that the identification of some specific inconsistencies in their findings to the theory could be consequence of the study of a single industry where particular features may exist and the typology is unable to measure them.

Different from prior studies, McDaniel and Kolari (1987) and Conant, Mokwa, and Varadarajan (1990), emphasised in their analysis differences in the marketing orientation of different firms within the Miles and Snow's typology. McDaniel and Kolari (1987) investigated the strategic marketing responses of the different strategy types (Defenders, Prospectors and Analysers). They found that Defenders were organisations consistently lacking in marketing orientation that concentrated their attention on current products and markets. By contrast, Prospectors were organisations that were strongly marketing orientated exploring new product developments and new market opportunities. The Analysers fitted in between; they either adopted aspects of the Defender or Prospector strategic marketing

[2] (but only in competitive industries).

emphasis. McDaniel and Kolari's (1987) findings are consistent with the typology related to the marketing element. Nevertheless, McDaniel and Kolari neglected in their analysis to assess the organisational performance implications of different marketing stances as well as the analysis of the Reactor strategy type.

Conant et al, (1990) analysed the relationships between strategy types, distinctive marketing competences and organisational performance. Distinctive competences refer to those things that an organisation does especially well in comparison to its competitors (Selznick, 1957). As suggested by Miles and Snow (1978), their findings demonstrated that Prospectors presented superior marketing competences (in exploring new product and market opportunities) compared to other strategy types, Defenders had relatively weak marketing competences and Reactors had weak marketing competences. In terms of organisational performance Conant, et al. (1990) found that, conforming to the theory, all three types performed equally well in terms of profitability and outperformed Reactors. Overall, the results were consistent with Miles and Snow's findings. However, they were limited in their organisational performance analysis as they, in common with others, used only subjective profitability measures. More performance indicators are required to better understand performance differences among the strategy types.

Shortell and Zajac (1990) assessed the reliability and the validity of Miles and Snow's various measures. To achieve this they used a perceptual self-typing approach and archival data from two periods of time; used a multi-indicator approach emphasising the convergent validity of the typology measures; tested the typology dimensions (entrepreneurial and administrative), across a variety of strategic contexts, i.e. intended versus realised strategy; and used a portfolio approach to strategy (focusing on the rates at which new products and services are introduced).

The entrepreneurial dimension focused on the overall strategic orientation, the emphasis given to new market and new service development activity and the assessment of the market

growth. The administrative dimension focused on the perceived quality of the strategic planning process in terms of formality, innovativeness and market research capability.

Their results show that Prospectors had the highest score and Defenders the lowest score in new-market, new-service development, and market growth. Analysers occupied an intermediate position. Prospectors exhibited the highest score in planning innovation and market research and were followed by Analysers and Defenders. Related to intended and realised strategies, their findings revealed that firms expected within two years to increase their emphasis on the diversification services.

Overall, their results provided strong support for the measurement validity of Miles and Snow' strategy types. In general, their findings suggest that perceptual measures are congruent with archival measures of Miles and Snow's strategy types and researchers can use the typology with increased confidence in future work on organisations and their strategies. However, Shortell and Zajac (1990) neglected the analysis of the engineering dimension of the strategic typology and the Reactor strategy type.

James and Hatten (1995) sought to provide additional support to Shortell and Zajac's (1990) findings concerning the convergent validity of the self-typing paragraph approach to identify strategic types. They assessed the validity of this measurement instrument by linking Miles and Snow' types to secondary data on variables that reflected firms' market and risk postures. Their findings showed that variables reflecting different market postures predicted different strategic types. They proved how well the self-typing paragraph approach performs in a different industry and the scale proved to be a reliable measure. Their findings support Shortell and Zajac (1990) on the convergent validity of the self-typing paragraph approach to identifying strategy types. Their results suggested that Defenders and Analysers took less financial risks and had higher variance in non-performing loans (i.e. consistency in credit assessments and credit risks taken) than Prospectors. Defenders and Analysers took venturesome financial positions but had greater difficulty in their lending business. They ignored the Reactor strategy types in their analysis. This study will attempt to explore the

validity of the self-typing paragraph approach to identify strategic types and therefore to show research evidence for Shortell and Zajac (1990) and James and Hatten's (1995) results.

Other researchers like Slater and Narver (1993) and Thomas and Ramaswamy (1996) analysed only one of the Miles and Snow's typology dimensions. Slater and Narver (1993) explored the entrepreneurial problem while Thomas and Ramaswamy (1996) investigated the administrative dimension. Slater and Narver (1993) aimed to describe the influence of business variables on profitability for the strategy types (Prospectors, Analysers and Defenders). To accomplish this, they clustered business unit based on proactiveness, competitive advantage and market focus – these are dimensions of the entrepreneurial problem. Slater and Narver explored the determinants of performance profitability: SBU autonomy, market orientation, human resources emphasis and relative cost. Proactiveness is the way that organisations undertake to growth. Organisations can achieve growth through market penetration, market development, product development and introduction of new products into new markets. Their results illustrated that Defenders pursued growth through market penetration; Prospectors through the development of new product or market opportunities; and, Analysers expanded their business taking either the Defender or the Prospector options for growth. Defenders based their competitive advantage on low cost by developing high cost-efficiency. Defenders were committed in pursuing low costs. Prospectors based their competitive advantage either on low-cost (a cost advantage can be reached through learning or experience effects) or differentiation (high quality, high service or development of new product technologies), or both. Analysers based their competitive advantage on differentiation. They concluded that Prospectors were positively associated with strong market orientation-new product developments and autonomy. Innovation was positively associated with profitability and negatively with market growth especially in uncertain markets. Analysers also had significant market orientation and costs advantages over Prospectors. There was a strong relationship between low relative cost and profitability. However, Slater and Narver (1993) excluded the Reactor strategy type from their analysis.

Thomas and Ramaswamy (1996) investigated the validity of the administrative dimension of the Miles and Snow's typology. They analysed whether organisations employing particular strategies were led by managers with particular skills and attributes and whether this strategy-manager alignment had performance implications. Their results demonstrated that organisations, which were able to match managerial characteristics and strategic direction, performed better than those with an absence of the alignment. They evidenced the impact that an organisation's leaders had on performance outcomes and they validated the administrative dimension of Miles and Snow typology. They concluded that: organisations employing distinctly dissimilar strategies were led by managers with distinctly dissimilar attributes; the match between executive characteristics and strategy had a positive influence on performance; and, the strategy-manager match had a greater impact on performance than on a firm age, size, and industry membership.

Within a Portuguese mould industry context, Gomes (1998) through a post-hoc identification at the corporate level, attempted to categorise four organisations (one firm in the domestic appliance industry; and three firms within the Portuguese mould industry) into the Miles and Snow's strategy types. Technological innovation and market orientation attributes were compared among the organisations. He concluded that two organisations were pursuing the Analyser strategy type, and two were employing the Defender strategy.

Different from previous research Zajac and Shortell (1989) add a new perspective to the analysis of Miles and Snow's (1978) strategy types. They have analysed the dynamics of Miles and Snow's strategy types. With the exception of Zajac and Shortell (1989) the dynamic process of changing from one strategy type to another has been surprisingly neglected in the literature. The Miles and Snow' dynamics of strategy is discussed in detail below.

2.5.2.2. The dynamic viewpoint

Miles and Snow (1978) suggested that strategies tend to persist over time as, over time, organisations pursuing a strategy type develop internal consistencies according to its strategic stance. They argued that organisations build up and define a set of repertoires to respond to changing environments and therefore, they tend to proceed with their strategy, avoiding strategic change. Strategic change is argued to be something to be avoided whether because firms have difficulty in accepting the need for change or are not able to implement it. Changing strategy is difficult, expensive and consequently is seen as unlikely to occur. Prospectors tend to want to continue prospecting and Defenders tend to want to continue defending. Miles and Snow (1978) explained the difficulty for firms to change strategies but they offered no analysis of whether, over time, firms that are following the behaviours encapsulated in one strategy types change to another.

Other researchers share the same Miles and Snow's point of view. Oster, (1982) suggested that organisations might be unwilling or unable to change strategies, which have become entrenched. Miller and Friesen (1984) add to Oster's notion that firms not only continue with their existing strategy, even when confronting environmental changes, but they tend to extend it and develop it further. Miller (1986:237) stresses that "only when change is absolutely necessary or extremely advantageous will organisations be tempted to move concertedly and rapidly from one configuration to another that is broadly different. Such changes, because they are so expensive, will not be undertaken very frequently. Consequently organisations will adhere to their configurations for fairly long periods."

Nonetheless, Zajac and Sortell (1989) in their empirical study investigated whether firms had changed their strategy over time in response to changing environmental conditions. They investigated: (1) the notion of equally viable strategy types versus particular appropriate strategy/environmental combinations, and (2) the relative influence of process (ability to change strategies) versus content (desire to change strategies) issues. They also examined the likely direction (current strategy influencing the likelihood to change to other strategy) and the performance implications of organisations changing their strategy in response to environmental changes.

Zajac and Shortell findings suggested that:

(1) Organisations do change their strategies in response to particular environmental circumstances. They found that of 432 hospitals, 55% had changed their strategy and 45% had not. Concurrently, Smith and Grimm (1987), despite their small empirical sample of 27 firms in the railroad industry, also found that most of the railroad firms had changed their strategies in response to railroad deregulation. Therefore, changing strategies in organisations is not as unusual as suggested by Miles and Snow. Our assertion here is that changes in strategy types do occur, and organisations do not perceive strategy types to be equally viable in different environments over time. This assertion will be tested in the data from the Portuguese Mould Industry.
(2) The impact of a particular major environmental change can induce changes in strategy in a non-random way driving firms to move away from one strategy type towards another; from the Defender to Analyser (primarily) and Prospector strategy. Major environmental changes do not simply result in changes in strategy but there is a pattern of strategy across organisations. Shifting from one strategy type to another suggests that organisations do not all perceive strategy types to be equally viable in new environments, which constrains the typology.
(3) An organisation's previous strategy can be a potential discriminator of organisations that change their strategies compared to those that do not. This can lead to three different aspects of the organisational change of strategy in response to environmental changes: a) the awareness of the need to change strategy; b) the willingness to consider a change of strategy; and c) the organisational capability to change strategy. Changing strategies seems to be the organisation's response to dealing with environmental changes.
(4) Organisations embedded in dynamic environments and employing the Defender strategy type are likely, on average, to be less profitable than those pursuing other strategy types. Strategy types may not be equally viable in the environments and may not perform equally well. Defenders performed poorly, relatively to Analysers and Prospectors. In a

constantly changing environment, Prospectors and Analysers outperformed Defenders. This was also corroborated by Shortell, Morrison and Friedman's (1990) findings.

(5) Different performance results were exhibited across strategy types but not between firms that changed their strategy versus those that did not. Therefore, changing strategies is not a good predictor of performance differences. It does not necessarily mean organisational performance at the forefront. Organisations that change strategy may or may not outperform those that do not change.

(6) Organisations changing to one specific strategy type are no more or less profitable than those changing to other strategy type, e.g., organisations changing to Defenders, may or may not outperform those that changed to Analysers or Prospectors.

Nonetheless, Zajac and Shortell (1989) only analysed strategic change from one timescale to another and have only used a profitability measure of performance (profit margin ratio). The current study attempts to use five different timescales, as well as a comprehensive set of organisational performance measures to test change on the six dimension listed above. The aim is to enhance further knowledge to the dynamics of strategy and organisational performance relationships and to give further consistency to the results.

In order to synthesise the Miles and Snow's research evidence, a table has been developed (see appendix 1H1, Table 1H1b). It shows the researchers who have explored Miles and Snow, what they have investigated, the characteristics of their samples, their measurements, the data analysis conducted, the results of their investigation and whether they support the typology or not. The aim is to validate prior research. Despite overall validation, the typology has some methodological limitations. The next section describes and discusses Miles and Snow's typology criticism.

2.5.3. Miles and Snow's typology criticism

The absence of the use of multiple indicators and the lack of reliability and validity tests in preceding studies suggests that it was assumed validity of the typology that may not exist.

Hambrick (1983:7) stated that "the apparent power of the typology rests on artificial evidence, Miles and Snow (1978) used a post hoc explanatory behaviour and thus it seems that research methodologies and biases may yield the appearances of a more powerful typology than may in fact exist". Some researchers have limited their analysis to conceptual data, qualitative observations based on case studies and experiences rather than empirical operationalisation (Miles and Snow, 1978; Miles and Cameron, 1982; Ruekert and Walker, 1987). Zahra and Pearce (1990) stressed that little evidence of the typology's construct and predictive validities is due to the fact that researchers did not use a consistent methodology. Inconsistencies of the typology's validation can be developed on four main criteria:

(1) Previous research has been predominantly descriptive. Its poor conceptualisation is based on case studies, experience in limited number of industries and use of small sample sizes;

(2) Serious flaws exist in the identification of the strategy types as a result of using subjective measures of strategy. Researchers have not studied the four strategy types in a uniform manner: some have analysed all four forms of strategy types (Snow and Hrebiniak, 1980; Conant et al, 1987 and 1990; Zahra, 1987; Segev, 1987 a; Odom and Boxx, 1988; Usidken, et al, 1988, Namiki, 1989; Smith et al, 1989;); some have only used Defenders and Prospectors assuming that Analysers will fit in between (Hambrick 1981a,b, 1982, 1983; Barret and Windham, 1984; Simon, 1987; Thomas and Ramaswamy, 1996) and others have omitted the Reactor strategy type (Meyer, 1982; Chaganti, and Sambharya, 1987; McDaniel and Kolari, 1987; Zajac and Shortell, 1989; Shortell and Zajac, 1990; Slater and Narver, 1993; James and Hatten, 1995). Snow and Hambrick (1980) found that Reactors outperformed all the other strategy types in highly regulated industries. Therefore the Reactor strategy type is worthy of investigation in the following areas: (a) whether Reactors change their strategic practices; (b) whether Reactors change their strategy towards other strategy types; and (c) whether particular characteristics exist in the environmental conditions where they perform relatively well. Additionally previous research has either assumed the validity of the model, or identified the strategy types based on a single dimension; generally only one or two problems of the *adaptive cycle* were tested. Though the model includes several key dimensions.

(3) The theory states that the four organisational strategy types will be equally distributed in a given industry. However, Snow and Hrebiniak (1980) showed there to be more Defenders and Prospectors and that Reactors outnumbered all the strategy types specifically in the air transportation industry. Zahra and Pearce (1990) suggested that only by examining the underlying characteristics of the competitive settings could the efficacy of the given strategies be judged. Nevertheless, most of the attempts to validate the typology have a tendency to classify industries broadly without considering its quirks and thus misinterpreting the theory. For example, the product life cycle and the degree of industry innovation can constrain the applicability of the Miles and Snow's typology and it should be take into account the stage of those in the industry environmental analysis. Reactors can perform well in a governmental regulated environment; Prospectors can perform in a dynamic and changeable environment where product innovation is constantly required, and Defenders can perform well in industries where there is a relative stability in the environment.

(4) Researchers have ignored strategic process considerations (company size, environmental attributes, and the fit between strategy types and process) and their impact on organisational performance.

With the exception of just a few studies: Simon (1987) in Canadian firms; Segev (1987a) in kibbutz-owned Israeli industrial enterprises; Weisenfeld-Schenk (1994) in biotechnology industry in the UK and Germany, and Ghobadian; et al. (1998), in electricity distribution and supply industry in England and Wales; all the others researchers have validated the typology within an American context. To analyse the utility of the theory in predicting strategic behaviour it would be need to test the typology in different cultural environments from where it was developed (i.e. the United States).

In sum, strategic typologies are useful tools in presenting information. They increase awareness and discernment about the organisation current business strategy position. They help managers to assess firm's capabilities in relation to their competitors. Namiki (1989:72) stated that they have "potential to be a powerful tool in guiding top executives to select a

strategy, organise firms' structures, and effectively allocate resources to functional departments. They can also be used to assess strengths and weaknesses of firms in following a particular strategy relative to their competitors, which can help to initiate corrective actions". Nevertheless, the use of generic strategies or strategic typologies has also shortcomings. The following section outlines some of its weaknesses.

2.6. Weaknesses of generic strategies

Generic strategies are a broad categorisation of firms' strategic behaviours. Its parsimony is seen as an incomplete view of strategy. Its generic character limits its applicability. First, they are unlikely to be suitable at different points in time as business undergoes continuous and discontinuous changes; they need to be understood within particular timescales and set of economic, sociological and technological circumstances since they represent an organisation's strategic position at a given time. Second, they ignore industrial and environmental particularities (Hambrick, 1983; Smith et al., 1989). Each strategic typology investigates patterns of certain competitive variables within certain competitive environments: thus they seldom could be suitable for all industries or services. As Namiki (1989:85) stated, relating to the Miles and Snow's typology, "strategy is a complex phenomenon, and a more complicated typology including several major strategy dimensions is needed to comprehensively explain the strategic behaviour". In order to fulfil the knowledge gap, the research attempts to extend the Miles and Snow's strategic typology. The aim is to achieve a comprehensive and holistic view of the organisational relationships with its environment. Therefore, it endeavours to comprehensively analyse and measure the organisation's internal (product/service-market domain, marketing policy, organisational philosophy, organisation investments, people-knowledge, technology profile, organisational management) and external environment (customers, competitors, suppliers and environmental trends).

Another aim of the research was to gain a robust understanding of business strategy and organisational performance relationships. In order to assess the organisation's strategic

orientation organisational performance analysis is required. Understanding the organisation's strategies and their impact on organisational performance helps managers to comprehend which factors could drive organisations to succeed. Different strategies may be associated with different levels of organisational performance and therefore it is important to investigate which business strategic behaviours are associated with high levels of organisational performance. The achievement of organisational performance is not only important, it is absolutely necessary. As suggested by Mathur and Kenyon (1997:455) "the purpose of business is to create financial value: to earn more than the cost of capital". The following section describes and analyses organisational performance and business strategy relationships, namely assessing organisational performance in the context of Miles and Snow's strategy types.

2.7. Organisational performance

The purpose of this section is to review literature on the concept of organisational performance and on Miles and Snow' strategy types and organisational performance relationships both from a static and dynamic perspective.

2.7.1 Organisational performance: the concept

Organisational performance is a complex, multi-dimensonal phenomenon that is difficult to understand and measure (Goodman and Pennings, 1977). Different organisations have different performance objectives and performance may vary according to the targets set, the time period observed, the criteria used and on whose perspective is being taken (e.g. the customers', the managers', the employees' or the shareholders'). Though, organisations move towards to achieving satisfactory performance, independent of what defines it.

Performance measures are needed in the organisation to evaluate how well the firm functions. The perspective being taken here is that a suite of measures are needed that will reflect objectively and consistently the quality of the strategic decisions that have been made within

firms (Chakravarthy, 1986). The measures must allow us to compare performance across firms and to compare or track performance over time (Fry, 1995). Performance measures enable the organisation to plan and control and therefore assist the decision-making process. As is acknowledged what we cannot measure, we cannot control and what we cannot control, we cannot manage (Walsh, 1996). The lack of performance criteria and objective measures of these criteria make it difficult for the organisation to plan or control (Globerson, 1985). As suggested by Nanni, et al. (1990), performance measures enable the control of the organisation against a specific standard or expected value. Performance measurement is a complex issue and several researchers have attempted to develop an understanding of the issues relevant to organisational performance and its measurement, (see Dawson, 1996, Dixon, et al., 1990, Eccles, 1991, Lenz 1981, Lynch and Cross, 1991, Kaplan and Norton 1992, 1993,1996, Neely, et al., 1997).

Performances measures should be derived from strategy (Globerson, 1985; Fortuin, 1988; and Maskell, 1991). As suggested by Kaplan, and Norton (1992, 1993, 1996), the choice of performance measures must match the organisation's strategic goals and must capture organisational objectives. Organisations may vary in how well they perform depending on their business strategy. Strategies differ among firms and the adoption of different strategic stances (as characterised by the Miles and Snow typology, for example) may be related to systematic differences in business performance. The next section discusses literature on business strategy, namely Miles and Snow (1978) and organisational performance relationships.

2.7.2. The Miles and Snow's strategy types and organisational performance

2.7.2.1. The static viewpoint

From the literature we can distil a number of propositions that will assist in the development of a data analysis strategy for the Portuguese Mould Industry data. The propositions that emerge from the literature are:

Miles and Snow (1978)

Miles and Snow (1978) alleged that Defenders are organisations that are efficiency orientated and Prospectors are effectiveness orientated. Analysers will fit in between the two extremes. Reactors are poor performers.

A Defender's usual method of assessing performance involves comparing present indices of efficiency with those achieved by the organisation during previous time periods.

Prospectors usually define organisational performance in terms of outputs or results and they evaluate effectiveness by comparing past and recent performance with that of similar organisations.

For Defenders production and finance functions are seen as the most important functions while for Prospectors, marketing and product development are considered as the most crucial areas.

During difficult times, a Prospector behaves much like the Defender: it cuts back in areas not directly related to its distinctive competence.

Snow and Hambrick (1980)

Snow and Hambrick found that Defenders, Prospectors, and Analysers are equally likely to perform well in competitive industries, given that they respond to the challenges of the adaptive cycle in a consistent way.

Defenders and Prospectors have different strategies and both financially succeed in terms of profitability (ratio of total income to total assets-ROA).

Reactors performed poorly in competitive markets but well in highly protected and regulated markets.

Hambrick (1983)

Hambrick found that significant performance differences exist between Prospectors and Defenders, depending on both, the environment and the performance measures used.

Defenders outperformed Prospectors on profitability in non-innovative industries and Prospectors outperformed Defenders in market shared in innovative industries.

Defenders consistently outperformed Prospectors on profitability (return on investment-ROI) and cash flow (CFOI) in non-innovative industries.

Prospectors were negatively associated with ROI and CFOI in every type of environment examined. Prospectors' costs and risks of product innovation were significant to allow high values of profitability and cash flow.

Prospectors outperformed Defenders in terms of market share but only in innovative industries. In mature non-innovative industries both Prospectors and Defenders performed lower in ROI and CFOIs than Analysers.

Namiki (1989)

Namiki showed (based on subjective measures of organisational performance) that Prospectors in highly dynamic and changeable environments outperformed all the other three-strategy types in terms of sales growth and "overall" performance.

Prospectors, Defenders and Analysers had significantly higher sales growth, than Reactors (measure that shows how well an organisation relates to its environment).

No differences in performance were found in Return on Total Assets (ROA, an efficiency measure) among the four strategy types.

Smith et al., (1989)

Smith et al., analysed the typology and its relationships with size and performance to show that (based on subjective measures of organisational performance) Defenders, Analysers and Prospectors performed equally well and consistently outperformed Reactors, corroborating Miles and Snow's (1978), and Snow and Hrebiniak's (1980) findings.

Contrary to theory expectations Defenders performed better as small firms, especially related to profits (i.e. small Defenders generally outperform large Defenders).

Prospectors seemed to perform better as large firms in all performance measures. Prospectors are described in the typology as being flexible and innovative, which are normally characteristics of small firms, as well as, having a broad market definition, product diversity, divisional structure, and allocating expenses for research and development, which are typical features of large firms. Prospectors cannot be either too large or too small; being too large would restrict flexibility and being too small would probably circumscribe the resources available for prospecting. This is an important contradictory aspect to the model and will be tested.

Slater and Narver (1993)

Slater and Narver found that innovation was positively associated with profitability and negatively with market growth, especially in uncertainty markets. There was a strong relationship between low relative cost and profitability.

2.7.2.2. The dynamic viewpoint

Zajac and Shortell (1989) analysed whether firms changed strategies over time in response to environmental conditions, whether firms change their strategy towards another and the overall performance implications. Their work has been used to develop an analysis strategy for the Portuguese Mould Industry data. They concluded that:

(1) Organisations do not all perceive strategic types to be equally viable in new environments. The notion that various strategy types perform equally well in different environments has also been questioned by Hall, (1980); Hambrick (1983), Harrigan, (1983), and Parks (1987). According to them, certain environments favour certain strategies over others. Organisations embedded in dynamic environments and employing the Defender strategy type were likely, on average, to be less profitable than those pursuing other strategy types; Prospectors and Analysers outperformed Defenders in terms of profitability in a proactive environment.
(2) Changing strategies is not a good predictor of performance differences; it does not necessarily mean that organisational performance will improve as firms change their strategic stance to one, which they think is more suitable to their environment. Organisations that change strategy, may or may not outperform those that do not, and
(3) Organisations changing to one specific strategy type were not more or less profitable than those changing to other strategy type, e.g., organisations changing to Defenders, may or may not outperform those that changed to Analysers or Prospectors.

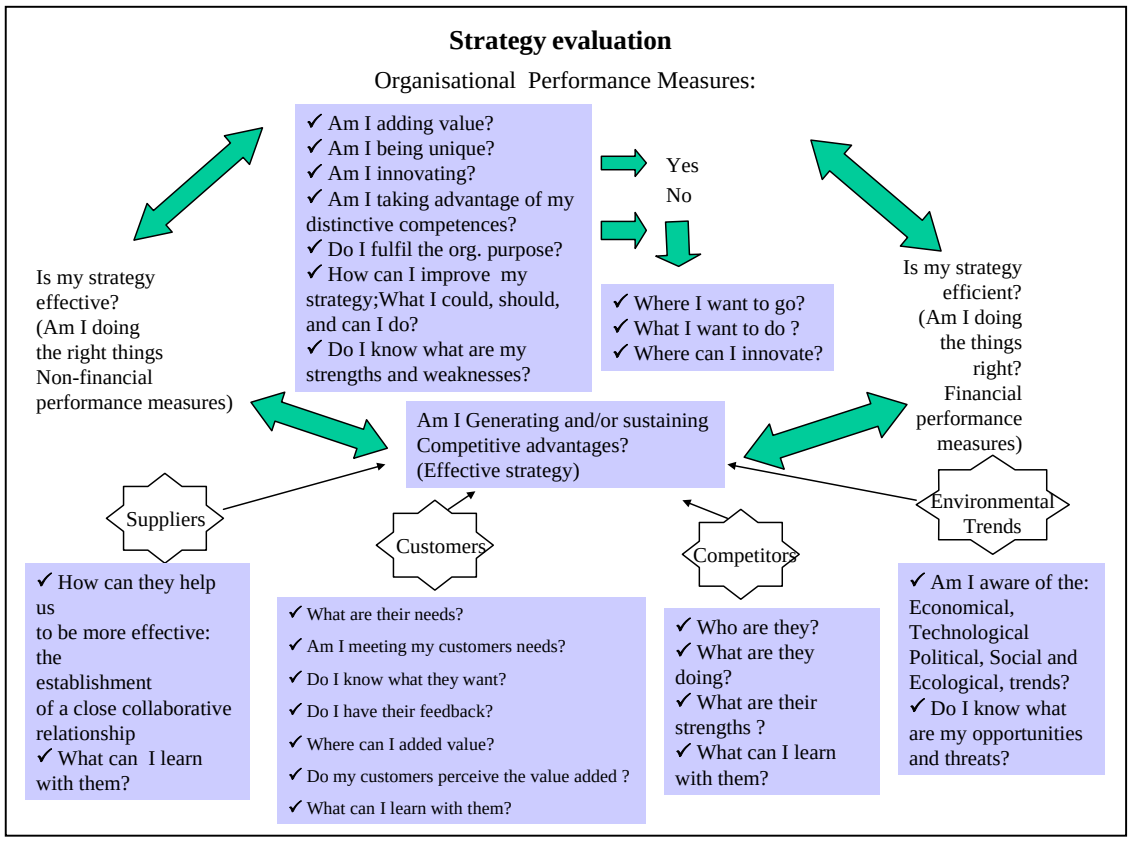
However, Zajac and Shortell, in their analysis have only used a profitability measure of performance (profit margin ratio), which could not be effective in measuring the Defender strategy. As verified by Hambrick (1983), Defenders and Prospectors differed in their performance depending on the nature of the environment and the performance measures used. Thereby the results may be biased, as the performance measure could be more appropriate for Prospectors and Analysers than for Defenders. The use of more performance measures is desirable to if the objective is to identify differences in organisational performance.

As seen previously, researchers were not methodologically consistent with the organisational performance measures employed, some have:

a) used different measures of profitability: ROI, CFOI, and market share financial measures (Hambrick, 1983); and ROS, ROA and ROE (Thomas and Ramaswamy, 1996);
b) utilised subjective self-report instruments on profitability-ROA, sales growth and "overall performance" (Namiki, 1989 and, Smith et al., 1989);
c) limited their organisational performance analysis to only a single measure of profitability, (Snow and Hrebiniak, 1980 - ROA; and Zajac and Shortell, 1989 - profit margin ratio).

Therefore, performance comparability in strategy types may be compromised; it may be biased by the use of different financial performance measures and by the use of one or two ratios to measure organisational performance. More performance indicators are needed to better understand performance differences among the strategy types. A framework has been developed to illustrate the holistic perspective of businesses strategy evaluation (see Figure 7).

Figure 7 - Business strategy evaluation



The research attempts to enhance further knowledge of the relationships between strategic stance and changing strategic stance with business performance. The empirical phase of the research will test the assertions identified in the section above.

2.8. Conclusions from the literature review

Literature on the concept of business strategy, key competitive factors that sustain or create competitive advantages, the dynamics of strategy, generic strategies, Miles and Snow's strategic typology, the weaknesses of generic strategies and organisational performance has been discussed in detail.

Strategy has its origins in the military context and some of its principles still remain applicable to the business strategy. In the 60 and 70s strategy was understood as plan formulation focused on the selection of markets and products. In the 80s strategy was synonymous with competitive analysis, strategic renewal and change. In the 90s, strategy was seen as the development of the organisation distinctive competences and as an integrative and interactive system linking the organisation and its external environment with the objective of creating organisational knowledge and customers' value added.

To enhance further understanding to the concept of business strategy several definitions from the most prominent contributors to the field were analysed. The theoretical assessment of the various business strategy definitions has resulted in the identification of common and distinct views of the concept. As a result a definition strategy, i.e. the concept of *effective strategy* has been presented. The constituent elements of an *effective strategy* should be verified in the process of business strategy development, independent of the industrial or service setting in which organisations are embedded.

Strategy is very complex and there is no single definition that can fully explain all its nature. Therefore, there was a need to continue to investigate literature on the concept. As a research objective is to understand the factors that form business strategy development towards organisational sustainable competitiveness, the literature competitive advantage was explored. Some researchers argue that to sustain or generate the organisation's competitiveness, strategy should be focused on the organisation's internal capabilities, such as technology, and people-knowledge. Conversely, others suggest that strategy should be focused on the organisation's external environment, i.e. the organisation's customers, suppliers, competitors and the analysis of the environmental trends. The research has combined all the above-mentioned strategic competitive elements and has produced a framework that illustrates the holistic point of view of strategy. It was developed to integrate and support the literature reviewed.

General literature has suggested that environmental changes may lead organisations to change their strategies. In order to maintain an alignment to the changing environment, firms may change their business strategy, or may only make minor adjustments. Change is difficult and expensive and firms may decide to change their strategic behaviour when they are only force to do so. To understand organisational and strategic change, literature has been analysed in detail. As suggested by Mintzberg, and Westley, (1992) there is a need for more research into organisational and strategic change to further our understanding of the phenomenon and to improve the management of it.

One important test of the theory is its ability to predict important outcomes. In an attempt to identify the key factors that sustain successful organisations and their strategies, researchers have identified and categorised common patterns of organisational behaviour, i.e. generic strategies and strategic typologies. Generic strategies are useful tools in guiding top managers in their process of decision-making. From a vast literature on generic strategies and strategic typologies emphasis was given to Miles and Snow's (1978) strategic typology. The Miles and Snow's concept, empirical support, criticism as well as methodological gaps were discussed and analysed in detail both in a static and dynamic viewpoint.

A further aim of the research is to analyse business strategy and organisational performance relationships. Literature on the concept of organisational performance and on Miles and Snow's strategy types and organisational performance relationships has been reviewed: both methodological gaps and gaps in our knowledge have been identified.

This chapter has provided an in-depth understanding of business strategy and organisational performance relationships and the identification of key strategic elements to underpin the development an empirical research framework. It has reviewed and analysed the evidence for validity of the Miles and Snow' typology derived from previous studies. The revised literature has shown that:

a) Miles and Snow's typology has been mainly tested within the American context,

b) the dynamics of business strategy; the analysis of strategic change over time have been surprisingly neglected by researchers.
c) researchers have restricted organisational performance analysis to the use of a limited performance measures.
d) there were no previous attempts to explore Miles and Snow's typology, the dynamics of strategy and their inter-relationships with organisational performance within the Portuguese context.

2.8.1. The literature review and the development of a research framework

While the prime purpose of the literature review is to map the boundary of the existing knowledge frontier, it is important to distil from the literature review the core concepts, operational measures of those concepts and key conjectures that the research process will address. The purpose of this section is to summarise these "distillations" in order to reveal the context in which the empirical research phase will be developed and conducted.

The concept of business strategy: the metaphors here are business strategy as developing and sustaining competitive advantage; delivering customer value added; developing and remixing the resources of the company; maintaining a symbiosis or fit between the company and its environment; matching products to changing markets.

The key strategic change drivers: these include changing customer preferences and expectations; technology shifts; supply chain pressures; changing global, geographical and sectoral market opportunities; competition; changing quality requirements; changing knowledge content of products.

The strategic change mechanisms: to maintain a high degree of fit between the firm and its environment the firm has a number of mechanisms it can use. The include enhancing quality; identifying new geographical/sectoral markets; increasing product complexity; enhancing the

service content of the product offer; relationship marketing; business promotion and development; reskilling/upskilling the workforce; increasing capital intensity.

The "patterned" strategic behaviour of companies: this is provided by the Miles and Snow typology, which contains within it a set of assumptions that will be formally tested. These assumptions indicate a set of behaviours and attributes that can be expected in different types of firms and a set of assumptions about how these classes of firms will perform relative to each other and differentially over time.

Business performance measurement devices: the review of the literature has identified a set of operational measures - such as profit margin, return on equity, return on assets, sales growth, return on sales, etc. that will be used to compare how different firms in different strategic types have performed a) relative to each other (i.e. cross-sectionally) and over time (i.e. longitudinally).

These sets of criteria have been used to develop a structure/framework not only for the overall design of the empirical phase of the research but also for the detailed design of the evidence collection instruments - namely an in depth questionnaire administered to 63 businesses.

Having specified the conceptual and operational framework in which the empirical research will be conducted, the next chapter will describe the industrial context in which the various research questions distilled from the literature review will be tested. The context is the Portuguese Mould Industry.

CHAPTER 3

The environmental context of the Portuguese mould industry

3. 0. Introduction

The purpose of this chapter is to describe the industrial context in which the research project has been constructed. Here, the objective is to discuss some of the main changes that occurred in the environment in which the Portuguese mould industry operates given that, in an earlier chapter, it was argued that business strategy can be conceived of as the way in which an organisation mediates its relationship with its external environment. To understand business strategy in the Portuguese mould industry, we need to understand the way in which the environmental context has changed and how firms have modified their strategies to create and sustain competitive advantage.

This chapter comprises seven mains sections. The first section describes briefly the history of the Portuguese mould industry; the beginning of the production of moulds for glass and for plastics; the development of exports; and the growth and development of the sector. The discussion will reveal that the Portuguese mould firms are small and medium-sized enterprises (SMEs). The next section describes what a mould is, and explains its manufacturing process.

In order to illustrate the Portuguese mould industry economic context, the third section, describes the evolution of exports, imports, exports by country and the industries served, from the 60s to the 90s.

It is however important to recognize the position of the Portuguese mould industry in the world. The fourth section discusses the Portuguese mould industry within an international context. Statistics of the International Special Tooling Machining Association are presented and analysed.

The fifth section, based on Porter five forces, builds up a table that synthesises the environmental context of the Portuguese mould industry (i.e. economic, political, technological, sociological, and ecological, in the past, present and future), draws up a future scenario and presents a SWOT analysis for the industry. The analysis enables to understand and contextualise the Portuguese mould industry strategic behaviour.

As one of the aims was to identify the key strategic factors that contribute to the development of business strategy and generate or sustain organisational competitive advantages for this industry, the sixth section reviews and discusses literature on key competitive factors in the Portuguese mould industry for sustainable competitiveness. The development of business strategy results in an interactive process between the organisation and its external environment. According to the Portuguese mould managers' the key competitive factors in the organisation are technology, a skilled workforce, the organisation's domain: markets - products and /or services and marketing; within the organisation's external environment, competitiveness is achieved through the analysis of customers, competitors, suppliers and environmental trends.

The seventh section concludes the importance of the analysis, and the contribution of this chapter to the research aims. It outlines the main points of the environmental context of the Portuguese mould industry and establishes a link between the *Literature Review chapter* and the specific issues to be analysed in the *Findings and Data Analysis* chapter.

3.1. Brief history of the Portuguese mould industry

The purpose of this section is to set out a brief historical perspective of the Portuguese mould industry.

3.1.1. The glass industry and the production of moulds for glass

The history of the Portuguese mould industry is intrinsically linked to the history of the Portuguese glass industry. The glass industry in Portugal has its origins in Marinha Grande. The Englishman Guilherme Stephens was invited by King Don José I to start a glass factory in Marinha Grande in the 1760s. The "Real Fábrica de Vidros" (the Royal Glass Factory) was established in 1769. The factory also operated as a school and soon skilled Portuguese workers come forth. It was the knowledge of these glass workers that later led to the development of a mould industry.

Marinha Grande soon became well-known as the "Capital of Glass" and Guilherme Stephens used to call the area the "Portuguese Manchester" (Mendes, 1993). The glass industry came to drive the economy of the region. In parallel with Marinha Grande, another centre of glass production was developing and flourishing in the region of Oliveira de Azeméis (Rodrigues, 1998). It was in these two regions that the plastic mould industry would be concentrated (see appendix 2A - Location of Marinha Grande and Oliveira de Azeméis in the map of Portugal).

The glass industry in Portugal had been born and, from these early beginnings, so was the need for glass moulds. In 1926, the first mould for glass was produced by Mr Aires Roque. Mr Aires Roque had come to Marinha Grande attracted by the glass industry. With him came his brother, Aníbal Henrique Abrantes. Aires Roque and his brother opened a mould workshop and until the mid 1930s it only produced moulds for glass (Duarte, 1969). The production of the moulds for glass led to the development of a skilled workforce, as well as competences and technical capabilities that were essential for the production of moulds for plastics (for further details about the history of the industry see appendix 2B1).

3.1.2. The mould industry and the production of moulds for plastics

In the mid-1930s plastics first started to make their appearance. These plastics were based on *phenolic resin*[1], which was transformed into a plastic product known as bakelite. With the appearance of plastic as a raw material, there was a need to produce

a different type of mould. In 1937, Aníbal H. Abrantes produced the first mould for plastics in Portugal. The moulds were produced with the equipment and the knowledge acquired in the production of moulds for glass (for further details, see appendix 2B2, the Aníbal H. Abrantes). In 1944 Aníbal H. Abrantes believing in the potential of the bakelite, established his own company (see Joaquim Menezes in *O Molde* n15, 1992). The first step for the development of the Portuguese plastic mould industry had been taken. In 1947, with the appearance of thermoplastic raw material, the first injection plastic mould was produced. Aníbal H. Abrantes was a successful company and had continuous employment growth, accounting for 50 employees in 1946, 100 in 1953, 150 in the early 60s and 250 by the end of the 60s (see Silva, 1996). In 1953 the company opened a new factory[2] thus becoming the first modern manufacturing plastic mould firm in Portugal.

Until1950, Aníbal H. Abrantes was the only firm manufacturing moulds for plastics in Portugal but other companies were established as Abrantes's most skilled employees left the company to establish their own firms. The sector grew based on the most qualified, entrepreneurial and risk-taking workers who were prepared to leave their current organisation to start their own firms. Some of these "offspring" organisations are now successful and well-known internationally firms and most of their managers learnt the art of crafting steel[3] at Anibal H. Abrantes. Aníbal H. Abrantes was considered the "university" of the Portuguese plastic mould industry and it was also at Aníbal H. Abrantes that exporting made its appearance.

3.1.3. The beginning of exports

Around 1954, Aníbal H. Abrantes was trying out a mould in Espinho (Oporto) when he met the Dutchman Toni Jongenelen, the export director of a Swedish musical instruments company. Toni Jongenelen, on seeing the ability of Mr. Abrantes in

[1] Phenolic resin is a plastic raw material, carbonic acid.
[2] see " A nova Fábrica de Moldes para Plásticos de Aníbal C. H. Abrantes", (The new mould plant of Aníbal C. H. Abrantes) in the newspaper *Região de Leiria*, 24.09.1953
[3] see Anibal H. Abrantes in an interview to the newspaper "*O correio de Azeméis*", Nº2777, June, 1981

producing moulds for toys, he signed a contract with him for trade all the moulds produced by Aníbal H. Abrantes. Exporting first began with the U.K.[4] and then the American market began to open up. By 1957 Abrantes was only producing moulds for export. However, Jongenelen and Abrantes had a disagreement, which resulted in Abrantes developing the American market by sending one of its employees to America to develop trade. The success of that trip revealed to Abrantes that they did not need Jongenelen as an intermediary and the company began to deal directly with customers and to export directly. In 1965, the business relationship between Jongenelen and Aníbal H. Abrantes ended.

Jongenelen started to deal with other Portuguese mould firms (e.g. Ernesto S. Simão in 1962[5]) and also stimulated and supported the establishment of new firms by ex-employees of Abrantes (See Américo Silva, *O Molde* Nº5, 1989). When Jongenelen's colleagues in America (see appendix 2B3) became aware of the Portuguese mould makers, they started to acquire moulds from Portugal. It was in this way that the sector began to develop its export base resulting in growing export markets in the 1950s and 1960s in Canada (see Emídio Maria da Silva, *O Molde*, Nº3, 1989), the USA (namely for HASBRO toys - see Fernando Neto de Almeida, *O Molde*, Nº7, 1990) and the UK (see Lúcio Rodrigues, *O Molde* Nº2, 1988; Armando de Pinho e Silva *O Molde* Nº4, 1989). The era of exports for the Portuguese mould makers had started – though mainly through the use of intermediaries.

The process of establishing new firms through the exit of the most skilled employees from the existing ones (especially from Aníbal H. Abrantes) has been consequently repeated in the growth of the Portuguese mould industry and was the origin of almost all new firms.

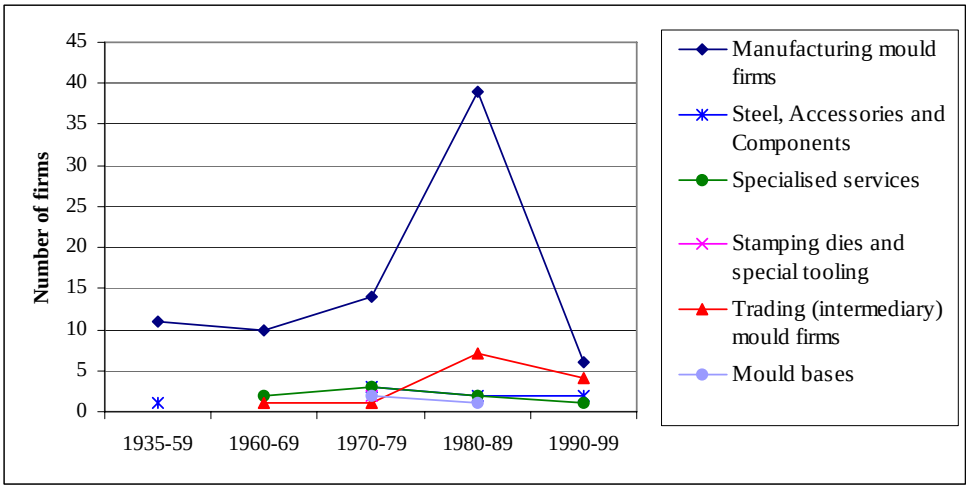
3.1.4. The Portuguese mould industry growth

[4] the first mould exported was to the U.K. and was a doll for Holloway Plastics (see Victor Hugo Beltrão in *O Molde,* Nº40, 1999).
[5] According to Mr. Ernesto São Simão (see *O Molde*, Nº9, 1990), Toni Jongenelen helped the company to initiate the firm's exports. However, his contribution was tarnished, by the way he exploited the firm, which encouraged the firm to search for its own clients overseas.

During the 40s until the end of the 70s the industry enjoyed continued growth but it was in the 80s that the Portuguese mould industry underwent a remarkable development. The number of newly established firms, particularly in mould manufacturing, boomed (see Figure 8). Internationally, the plastic market was growing quickly; plastic goods were becoming more fashionable and the sheer flexibility of plastic as a material meant that its use was growing considerably in many different applications (Rodrigues, 1997). As the demand for plastics was increasing, so too was the demand for moulds. The world demand for plastic goods was outstripping the supply from existing businesses. The 1980s were a boom time for the plastics industry.

In the 90s, the Portuguese mould industry continued to grow, but at a slower rate than in the 80s. This slow down resulted from increasing competition, an international economic crisis in the beginning of the decade and high interest rates (see *O Molde*, Nº20 and Nº21, 1993). For further details about the industry's growth see appendix 2C.

Figure 8 - The mould industry growth, number of new firms, 1935-1999

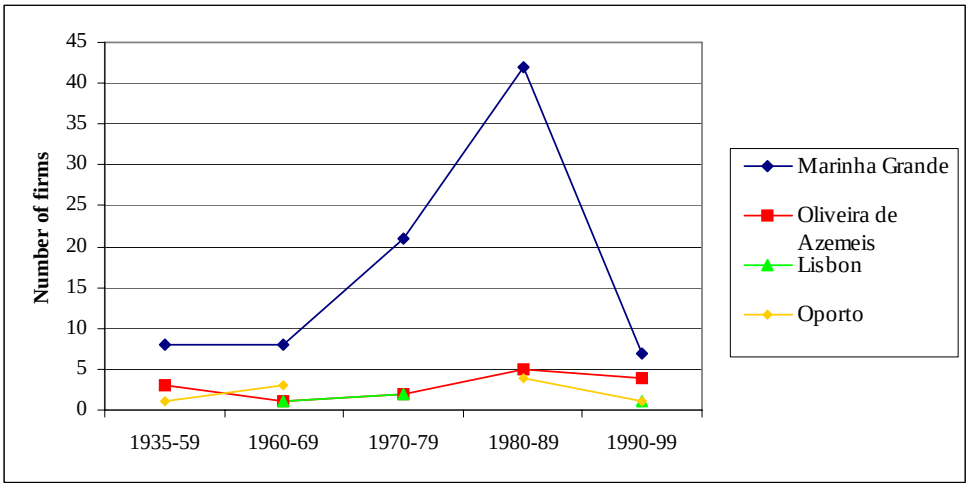


Source: combined sources, *O Molde* magazine and the Directory 98/99, ICEP

The new firms have mainly chosen Marinha Grande and Oliveira de Azeméis as a location and the industry is highly concentrated geographically (see Figure 9). There is considerable evidence to suggest that geographic concentration fosters innovation and the organisational competitiveness (Camagni, 1991,1995). Camagni developed the

concept of the "innovative milieu" and this links closely into the notion of business clusters as "cognitive communities". Indeed, these notions are seen as critical in the process of regional economic development. According to Camagni (1995:318), "Attention is focused on those areas in which strong elements of local entrepreneurialship; close interaction and cooperation among firms and relevant externalities associated with specialised labour markets enhance the competitiveness of the production fabric". In the Portuguese mould industry the acquisition of specific technologies, the exploration of certain markets or even the implementation of new management policies by certain mould firms tend to spread quickly to all the other firms in the industry as a result of this geographic proximity. This in turn fosters innovation and the development of more complex inter-firm dependencies and linkages. If a firm's innovation is recognised, it quickly spreads to another firm. If some firms decide to acquire certain technology, it is more then likely that others will follow suite. The same happens to both market and product opportunities. For example, if a rumour spreads that the Brazilian market is growing in demand, firms tend to target and explore that market. Consequently, in an applied industrial analysis project such as this, it is important to focus on a community of businesses incorporating competitors, suppliers and customers - this is a theme, which was developed in the literature review.

Figure 9 - The mould industry, geographic distribution, 1935-1999



Source: combined sources, *O Molde* magazine and the Directory 98/99, ICEP

Thus, the Portuguese mould industry has its genesis in employees or groups of employees that left the organisations in which they were working to establish their own businesses. As a result, the Portuguese mould industry is comprised solely of small and medium sized enterprises (see *O Molde*, Nº2, 1988:3). Small and medium sized firms are discussed in detail in appendix 2C4.

Currently the industry accounts for more than 250 firms, employs about 7500 employees[6] (with an average of 30 employees per firm) and has "a production value" of 73,050,740 billions Escudos, of which, 90% (65,745,666[7] billions Escudos) is for exports (see appendix 2C5). Therefore, this industry is extremely dependent on the environmental trends of the countries to which it exports. The sector is concentrated mainly in the region of Marinha Grande, the District of Leiria (60% approximately), Oliveira de Azeméis, the District of Aveiro (35%, approximately) and in Lisbon and Oporto (5% approximately). The sector has shown through the years a capacity to overcome difficulties and it has adapted considerably to market and technological changes.

Comentário [MOS1]: Draw a map of Portugal to suit people in the regions.

3.2. What is a mould?

The aim of this section is to describe what a mould is; to identify its utility and manufacturing process. A *mould* is a container used to make something into a particular shape. A steel mould comprises a female and a male part, that when fitted together, leaves a very narrow gap in which the fluid (such as plastic, glass, rubber, aluminium or other material) passes and is then shaped. In our everyday life, we are surrounded by a variety of goods that need a mould to shape them before they become a product. Moulded products range from the alarm clock that wakes us up in the morning, through to the toothbrush, the showerhead in the shower and the kettle that boils the water for our coffee. The car radio that we listen to on the way to work, the

[6] see CEFAMOL - the Portuguese Association for the Mould Industry at http://www.cefamol.pt, 2000. However, the researcher in filed counted about 400 firms, of which a significant part is micro-enterprises.

computer that we switch on to start work, the telephone that keeps us in touch with people, the fax, the photocopier, the stapler, the pen, the TV that we switch on to hear the world news or the medical device that controls our blood pressure as we become stressed during the day. Moulds are therefore manufactured for a wide variety of industries: automobile, electric/electronic, domestic appliances, toy, domestic utilities, medical, civil construction, office and garden furniture, and agriculture, among others. Nonetheless, an individual mould is a highly customised product, serving exclusively to produce the piece for which it was designed.

The number of plastic pieces to be produced, the complexity of the mould, the kind of product to be manufactured (e.g. food packaging, toys, or domestic utilities) have different design requirements. These will affect the types of thermoplastics used, the durability of the steel to be used, the number of cavities to be made, and the number of hot and cooling injecting channels required. There will, in turn, influence the way the mould is produced, its delivery time and its cost (further details about the mould manufacturing process can be seen in appendix 2D).

Having identified the meaning and the purpose of a mould and its manufacturing process, the next aim is to contextualise the Portuguese mould industry economically. This subject is analysed below.

3.3. The Portuguese mould industry economic context

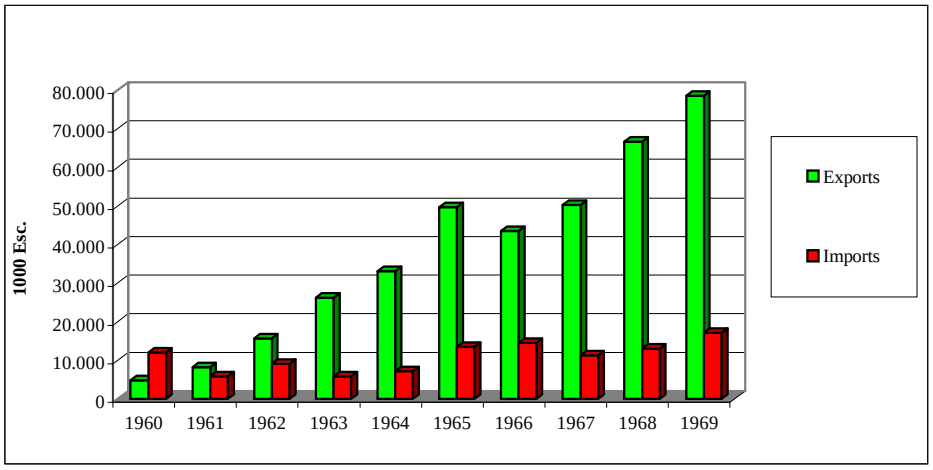
To understand the economic environmental context of the Portuguese mould industry, this section describes and discusses the economic evolution of the industry in terms of its exports, imports and exports by countries for the 60s and 70s, and exports, imports, exports by countries and industries served, for the 80s and 90s.

3.3.1. The 60s: exports, imports and exports by country

[7] An estimated value - 2001, source INE - The National Institute of Statistics. There are other industries in Portugal with higher turnover than the Portuguese mould sector. However, this

The Portuguese mould industry started exporting in the middle of the 50s. From then, exports have significantly increased (see Figure 10). In the 60s, with the exception of 1966[8], exports continued to grow (whether in tonnes or in value), at very high rates (for further details see appendix 2E1, table 2E1a).

Figure 10 - The Portuguese Mould industry, Exports, Imports, 1960-1969



Source: INE - The National Institute of Statistics

The USA was the main country for mould exports accounting, on average for 55% of the total exports. The USA was followed in second place by the UK. Comparing the American continent with the European, America was by far the leading destination of Portuguese mould exports (on average, the USA accounted for 65% of exports while Europe accounted for 24%, - see appendix 2E1, Tables 2E1b and 2E1c).

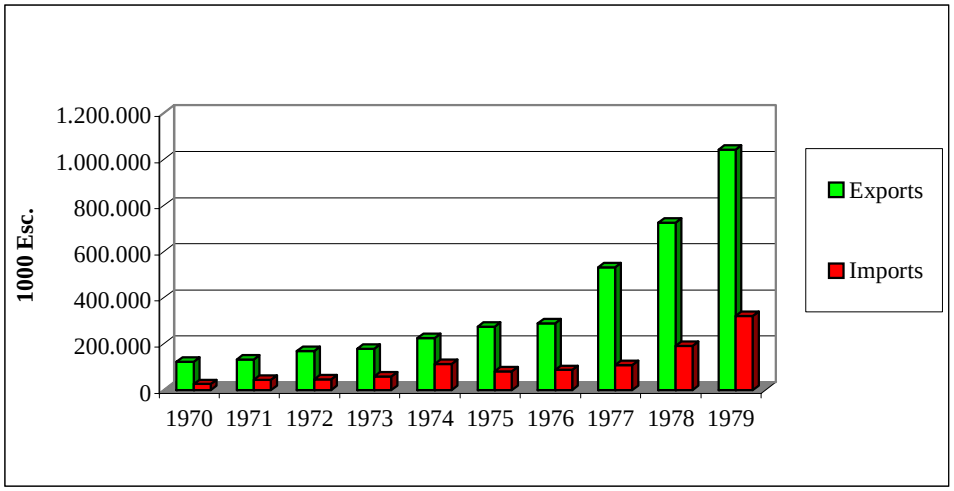
3.3.2. The 70s: exports, imports, and exports by country

During the 1970s, exports continued to increase (see Figure 11) accounting, in 1979, for almost 9 times more than their value in 1970 (see appendix 2E2, Table 2E2a). The USA continued to be the prime market, accounting, on average for 56% of total exports. The UK remained as the second most important market. The American continent continued to be the most important continent, accounting for 64% of total

industry is of major research interest as is highly technological orientated and innovative.
[8] The decline was a result of economic difficulties.

exports compared to Europe, which accounted for 24% (see appendix 2E2, Tables 2E2b and 2E2c).

Figure 11 - The Portuguese Mould industry, Exports, Imports, 1970-1979

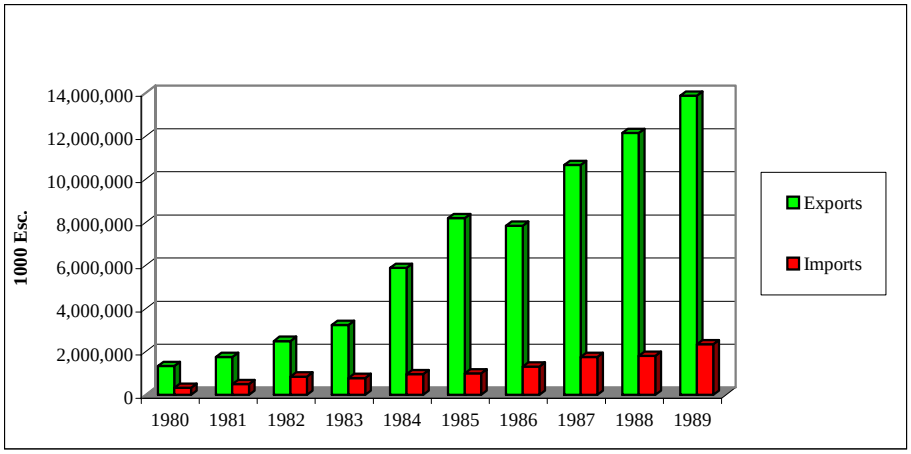


Source: INE - The National Institute of Statistics

3.3.3. The 80s: exports, imports, exports by country and industries served

For the period 1980-1989, the volume and value of exports increased significantly (see Figure 12), accounting in 1989 for 10 times more than their value in1980 (i.e. 13.877.091 billion Esc in 1989 and 1.337.970 billion Esc in 1980 - (see appendix 2E3, Table 2E3a).

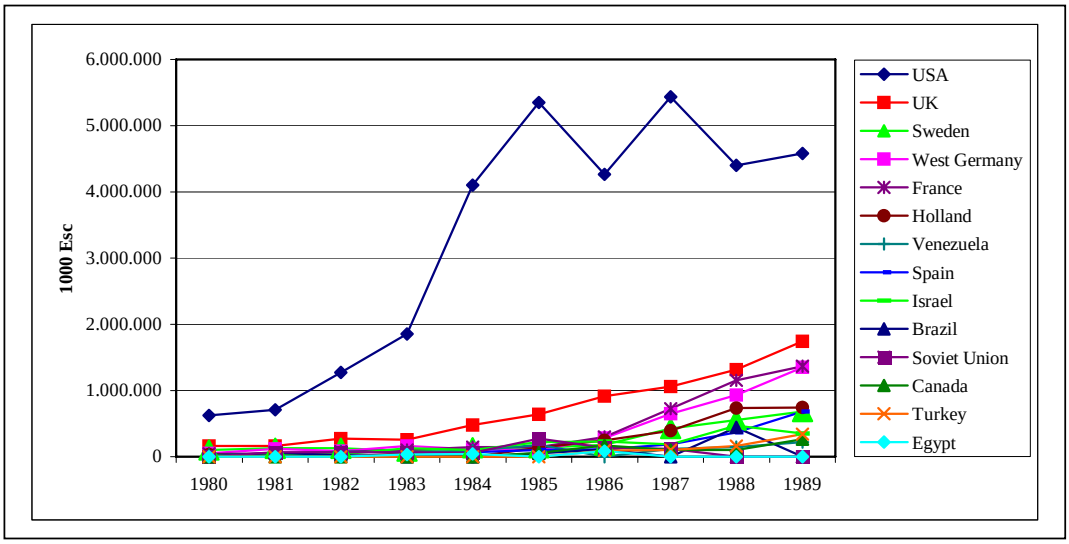
Figure 12 - The Portuguese Mould industry, Exports, Imports, 1980-1989



Source: INE - The National Institute of Statistics

During the 1980s, the USA continued to account for the largest share of exports (see Figure 13). Exports to the American market increased through the 1980s, registering their highest value in 1987. However, it is important to emphasise that until 1987, the American market represented on average at least 55% of mould exports from Portugal, yet in 1988 and 1989 this percentage dropped to 36% and 33% respectively (see appendix 2E3, Tables 2E3a to 2E3f). The UK ranked as the second most important market, and from 1986 to 1989 France occupied the third position. France was followed by West Germany, Sweden, Holland and Israel. Venezuela and Spain followed behind these main export locations (see appendix 2E3, Table 2E3g).

Figure 13 - The Portuguese mould industry exports by country, 1980-1989



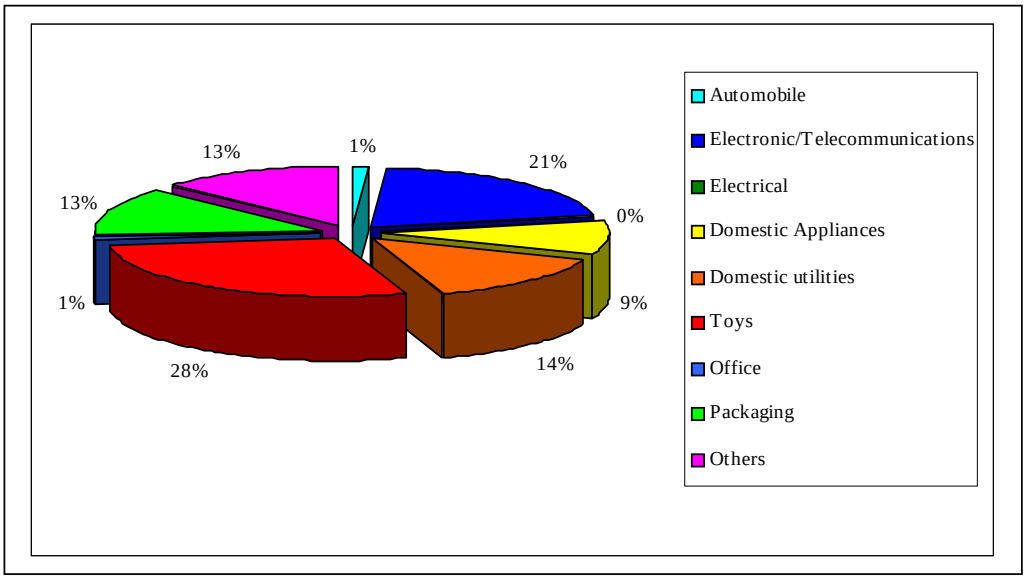
Source: INE - The National Institute of Statistics

While the above sections reveal how the geographical market for mould has changed, the following section explores how sectoral/industrial markets have changed. In 1984[9], Portuguese mould makers were mainly serving the toy industry, which accounted for 28% of total mould production in that year (see Figure 14). The toy industry was followed by the electronic/telecommunications industry with 21% of production and domestic utilities sector (with 14%). The packaging industry and the "other" sector (which may include moulds for agriculture, garden, furniture, medicine and civil construction among others) followed the domestic utilities, both accounting for 13% of production. The industries that accounted for the lowest values in 1984 were the automobile and office industries (each accounting for 1% of production). It is also important to note that the electric industry did not record any value in 1984.

The importance of the USA and UK markets for Portuguese mould makers was largely determined by the industries served in those geographical markets, i.e. the toy industry. In most cases, toy buyers were multinational firms with their head offices in America and in England (e.g. Hasbro).

[9] is the only data available for the 1980s

Figure 14 - Industries served as % of total production, 1984

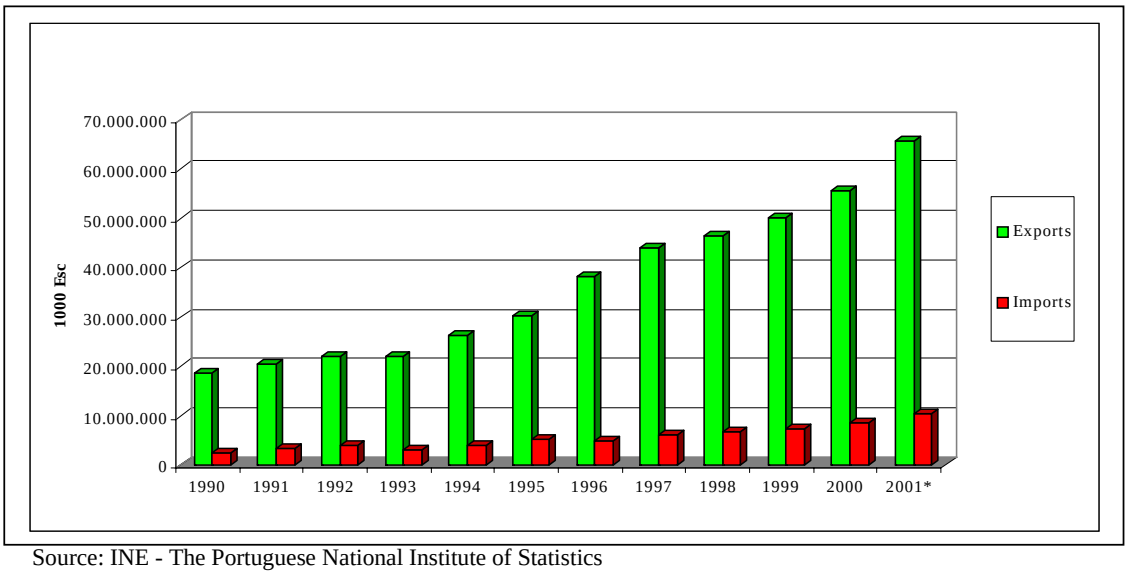


Source: ICEP- Investments, Trade and Tourism of Portugal

3.3.4. The 90s: exports, imports, exports by country and industries served

Between 1990 and 2000, exports continued to increase (both in value and in tonnes), but at lower growth rates than in the 1980s. In 1990, the value of exports was 18,800,594 billion Esc., and by 1999 this had risen to 50.021.054 billion Esc. However, from 1990 to 1992, exports increased relatively slowly and from 1992 to 1993 there was even a slight decline. This period corresponded to an international economic crisis in the beginning of the 90s. From 1994 onwards, exports increased significantly. The year 1995-1996 recorded the highest growth rate in the decade (see appendix 2E4, Table 2E4a). Imports were significantly lower than exports, which resulted in a strongly positive trade balance in the sector (see Figure 15).

Figure 15 - The Portuguese mould industry, exports, imports, 1990-2001



Source: INE - The Portuguese National Institute of Statistics
*an estimated value.

During the 1990s, the clear dominance of the US market declined as exports were switched to the German and French markets (see Figure 16). From 1990 to 1997 the US was the still the leading market for Portuguese mould exports but in 1992 exports to Germany almost attained the levels of those to the USA and, in 1996, exports to France almost equalled exports to the USA. In 1998, for the first time since Portuguese mould makers started their exporting (almost 5 decades ago), the German market became the most important market for Portuguese mould exports. From 1999 on onwards the French market become the leading market for the Portuguese exports. In 2001 the French market was followed by Germany in second, and the USA in third. Spain ranked fourth followed by the UK, Holland, Sweden, Mexico, Belgium/Luxembourg and Brazil (see appendix 2E4, Tables 2E4b to 2E4g).

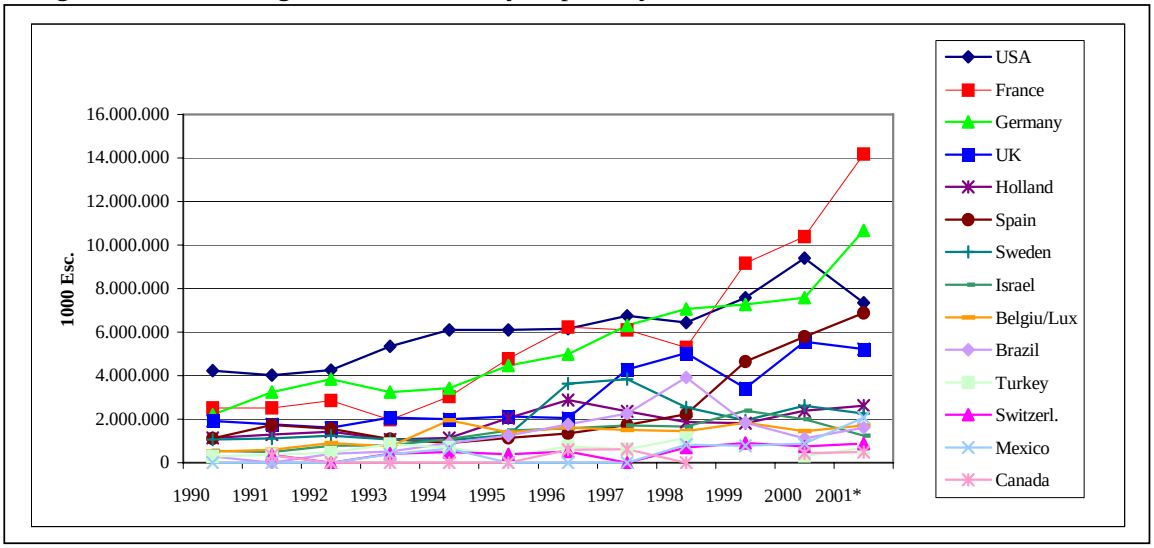
Clearly, the 1990s saw some considerable market shifting and there are three contributory reasons for this. The first, is Portugal's entry to the European Community; the second, is the erosion of the value of the Escudo against the dollar (see appendix 2F); and, the third, is increasing global competition (especially from Asian Tiger countries competing in particular at the low value-adding end of the market in the toy industry (see appendix 2J). The Portuguese entry to the European

Community encouraged the development of commercial relationships with customers from member's states. This occurred, as American customers were becoming a less viable option as a result of worsening exchange rates[10]. Asian Tiger countries were beginning to capture the American market (mainly moulds for toys) given their ability to compete on low wages at the low value adding end of the market. These forces compelled Portuguese mould maker to rethink their strategies in terms of the geographical markets served (due to the political greater European integration) and the industries served (i.e. the need to move away from the toy industry to other higher value adding industries). The change in both geographical and industrial markets meant that Portuguese mould makers also had to change their basis of competition away from low cost, low sophistication moulds to products that were more technologically demanding and complex.

During the 1990s, the USA, France and Germany were the countries to which the Portuguese mould makers exported most. It is important to emphasise that while in the 80s the American market accounted for, on average, 43% of total exports, in the 90s, the US market only represented 18%: this reveals a clear change in the pattern of exporting. The US market became significantly less important while the European market (namely France and Germany) increased its significance. The Spanish and the Brazilian markets also gained in significance. The geographical proximity to Spain, and its well-developed automobile industry may explain this growth (on average, Spain ranked eight on the 80s and fourth in the 90s). Trade relationships were stimulated by Portugal's entry to the European Community. The growth of exports for the Brazilian market (see appendix 2E4, Table 2E4h) may be explained by the "cultural proximity" (e.g. same language), high levels of economic growth in Brazil coupled with increased political stability and governmental support in the form of increased support for direct investment from multinational firms.

[10] The Portuguese mould makers would receive fewer Escudos if the American Dollar decreased between the beginning of the mould process (signature of the contract) and its conclusion. For further details about the effect of the exchange rates on the mould makers business, see appendix 2F- the exchange rates.

Figure 16 - The Portuguese mould industry, exports by main countries, 1990-2001



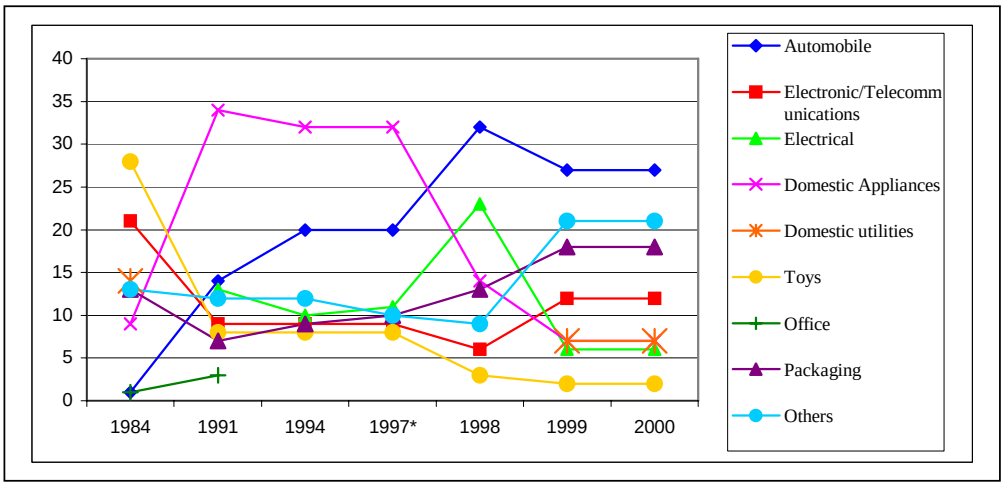
Source: INE - The Portuguese National Institute of Statistics
*an estimated value

Again, changes in geographical markets were accompanied by changes in sectoral markets. During the 1990s, the automobile and the domestic appliance industries were the most important client industries for Portuguese mould makers (see Figure 17 and appendix E Table 2E5a). However, while the automotive sector showed an increasing trend over the decade, the reverse was true for the domestic appliances sector (the automobile industry accounted for 14% of production in 1991 and 27% in 1999 and the domestic appliance accounted for 34% of production in 1991 and 7% in 1999). A possible explanation here is that several automotive companies have its head offices in Germany and France: indeed, one of the largest Portuguese mould firms (it represents 10% of the industry's total turnover) has a strong trading relationship with Renault.

During the 1990s, the packaging industry, the electronics/telecommunication industry and "other" industries all increased in importance. The growth of the packaging industry (it represented 7% of production in 1991 it and 18% in 2000) can be explained by the introduction of plastic in all kinds of packaging especially food and beverages. The electronics/telecommunication industry doubled its consumption of product from the mould sector between 1998 and 2000 (i.e. from 6% to 12%) and this was stimulated by the remarkable growth in portable electronic goods particularly

mobile phones, laptops and medical devices for domestic use. The growth of the "other" industries (it accounted for 12% in 1991, and 21% in 2000) can be explained by the increased use of the plastic in the construction, furniture, garden, agriculture, and medical industries. It is important also to note the remarkable decline of the toy industry from the 1980s to the 1990s. The toy industry has accounted for 28% of production, in 1984, and only 2% in 2000. The industries, which accounted for the lowest values were on average, the domestic utilities and the office equipment sectors (see appendix E, Table 2E5a).

Figure 17 - Client industries, as % of total production, 1984, 1991,1994, 1997* to 2000



Source: ICEP - Investments, Trade and Tourism of Portugal
* an estimated value
Note: the years used correspond to the data available

3.4. The international mould industry context, Portugal and the world

The aim of this section is to compare, based on a selected set of ratios, the Portuguese mould industry position with similar sectors in other countries. In order to analyse and compare information about the mould industry worldwide, this research made use of statistical information from the International Special Tooling and Machining Association (ISTMA) whose associates comprise mould and tooling associations from 17 countries. ISTMA provides comparative statistical information among the associated countries, such as:

- turnover, exports, imports,
- business ratios (investments in new technologies as % of turnover, liquidity ratio, net profit before taxes as % of turnover, and value of subcontracting as % of turnover) and
- employee ratios (turnover per employee, added value per employee, employee's total cost as % of turnover, and effective wages per hour).

Further details about the ISTMA and the definition of its business ratios can be seen in appendix 2G1 and 2G2. The research analysed data from 1988 to 1998[11].

3.4.1. ISTMA comparative statistics: Turnover, exports and imports

Turnover, Exports, Imports

For the period 1988-1998, turnover, exports and imports of the mould industry grew worldwide (see appendix 2G3, Tables 2G3a, 2G3b and 2G3c). In the USA, Japan and Germany, turnover was at its highest. The USA led the turnover as well as the importing suggesting that the American demand for moulds was greater than its internal manufacturing capacity. Germany was a major exporter and importer of moulds suggesting that German mould makers were exporting certain types of moulds and German plastic buyers were importing others. It is important also to emphasise that in 1998 Portugal, was the ninth largest world exporter of moulds and was the country with the lowest import value[12] (see Table 2).

[11] Data previous to 1988, was not available.

[12] It is important to emphasise that the rank positions and their comparison should be analysed with caution, with regard to the representativeness of the samples (number of participating firms of each country) in the total population. Another important consideration is the fact that the Portuguese findings only account for moulds, as this is the only activity within the Portuguese mould sector, which is contrary to all other country findings which include dies, moulds, jigs, standard tools, etc.

Table 2 - Summary of the turnover, exports and imports ranking of the ISTMA associated countries

		1988			1998		
		Turnover	Exports	Imports	Turnover	Exports	Imports
The highest Value in decreasing order	1º	USA	Japan	USA	USA	Germany	USA
	2º	Japan	Germany	Germany	Japan	Italy	Germany
	3º	Germany	USA	France	Germany	Canada	Canada
The lowest Value in increasing order	1º	Netherlands	Finland	Finland	Argentine	Finland	Portugal
	2º	Finland	Denmark	Portugal	Finland	Argentine	Netherlands
	3º	Portugal	Sweden	Sweden	Belgium	Korea	Finland

Source: ISTMA - The International Special Tooling and Machining Association

3.4.2. ISTMA comparative statistics - Business ratios

Investment in new technologies as % of turnover, Liquidity ratio, Net profit before taxes as % of turnover and Value of subcontracting as % of turnover

For the period 1988-1998, the investment in new technologies as percentage of turnover increased, indicating the extent to which the sector adopts new technologies (see appendix 2G4). Portugal is among the countries, which invested most in new technology. Yet, Portugal is not among the countries with the highest levels of turnover, suggesting that investment in technology has not yielded productivity growth. Portugal also showed low levels of net profit before taxes. Is suggested that the low levels of net profit before taxes may be a consequence of the low levels of technological productivity. It is interesting to note that the USA accounted for the highest levels of turnover yet it is one of the countries with the lowest investments in new technologies.

Table 3 has been developed in order to synthesise the ISTMA-associated countries with the three highest and lowest values in terms of investments in new technologies as % of turnover, the liquidity ratio, the net profit ratio and the subcontracting value as % of turnover. From the Table it can be seen that Portugal compares strongly internationally in its investment in new technology and in its ability to subcontract.

Table 3 - Summary of the ranking of investments in new technology as % of turnover, liquidity ratio, net profit, and subcontracting value as % of turnover of the ISTMA associated countries

Ranking Position		1988				1998			
		Investments in new technologies as % of turnover	Liquidity ratio	Net profit before taxes as % of turnover	Value of subcontracting as % of turnover	Investments in new technologies as % of turnover	Liquidity ratio	Net profit before taxes as % of turnover	Value of subcontracting as % of turnover
The highest Value in decreasing order	1º	Portugal	Great Britain and Spain	Spain	France	Great Britain	Switzerland	Canada	Korea
	2º	France	Japan and Sweden	Great Britain	Japan	Spain	Canada	Great Britain	Portugal
	3º	Spain	USA	France	Korea	Portugal	Spain	Switzerland	Italy
The lowest Value increasing order	1º	Germany	Portugal	Finland	Belgium	Argentine	France	Belgium	Argentine
	2º	Japan	Finland and France	Switzerland	Germany	France	Belgium	Portugal	Belgium
	3º	USA	Switzerland	USA	Great Britain	USA	Finland	Argentine and Germany	Great Britain

Source: ISTMA - The International Special Tooling and Machining Association

3.4.3. ISTMA comparative statistics - Employee ratios

Turnover per employee, Added value per employee, Employee total costs as % of turnover, Effective wages per hour

For the period 1988-1998, turnover per employee, added value per employee and effective wages on average, increased, while employee costs as % of turnover has decreased (see appendix 2G5). Portugal followed the same ISTMA growth trend, but scored on these measures far below of the ISTMA average. Portugal and Korea are typified by low scores on the set of measures suggesting, first, that there is a problem of profitability (i.e. they have lower turnover levels, higher expenses and more employees than countries like, Japan, or Switzerland) and, second, that their price competitive advantage may be underlined in their low employees total costs and in their low effective wages. The USA accounted for the highest wage value (see Table 4 which shows the three highest and lowest values of the ISTMA-associated countries in terms of turnover per employee, added value per employee, employee total costs as % of turnover, and effective wages per hour). It is interesting to note that employee costs

% of turnover is on average, decreasing while the employees' wages are increasing. This suggests that organisations have fewer, but more qualified employees, and that they become more capital and less labour intensive.

Table 4 - Summary of the employees' ratios ranking of the ISTMA associated countries

Ranking position		1988				1998			
		Turnover per employee	Added value per employee	Employee total costs as % of turnover	Effective wages per hour, average (1)	Turnover per employee	Added value per employee	Employee total costs as % of turnover	Effective wages per hour, average (1)
The highest Value in decreasing order	1º	Japan	France	Finland	Switzerland	Japan	Japan	Finland	USA
	2º	Switzerland	Switzerland	Germany	Denmark	Switzerland	USA	Sweden	Germany
	3º	France	Belgium	USA	USA	Italy	Switzerland	Japan and USA	Belgium
The lowest Value in increasing order	1º	Portugal	Portugal	Portugal	Korea	Portugal	Portugal	Korea	Korea
	2º	Korea	Korea	Sweden	Portugal	Argentine	Korea	Taiwan	Portugal
	3º	Finland	Finland	France	Netherlands	Korea	Argentine	Portugal	Argentine

Source: ISTMA - The International Special Tooling and Machining Association
(1) Designers only

The discussion so far has outlined some of the historical features of the sector and discussed how the geographic and sectoral markets that the mould industry has operated within have changed. In the next section, the discussion turns to a more detailed examination of the economic, political, technological, sociological and ecological factors that are affecting and will affect the sector.

3.5. Synthesis of the main points of the environmental context of the Portuguese mould industry

This section attempts to summarise the key points of the Portuguese mould environmental context that may have influenced and dictated firm's strategic behaviour. It analyses the economic, political, technological, sociological and ecological developments in the past, present and future. Furthermore, this section identifies the strengths, weaknesses, opportunities and threats of the industry by conducting a SWOT analysis for the sector.

The economic, political, technological, sociological and ecological issues that are affecting the sector are described in Figure 18. Porter's five competitive forces model has been used as a framework to inform the development of the sector (for further details see appendix 2H).

Figure 18 - The past, present and the future of the Portuguese mould industry, based on the Porter 5 competitive forces

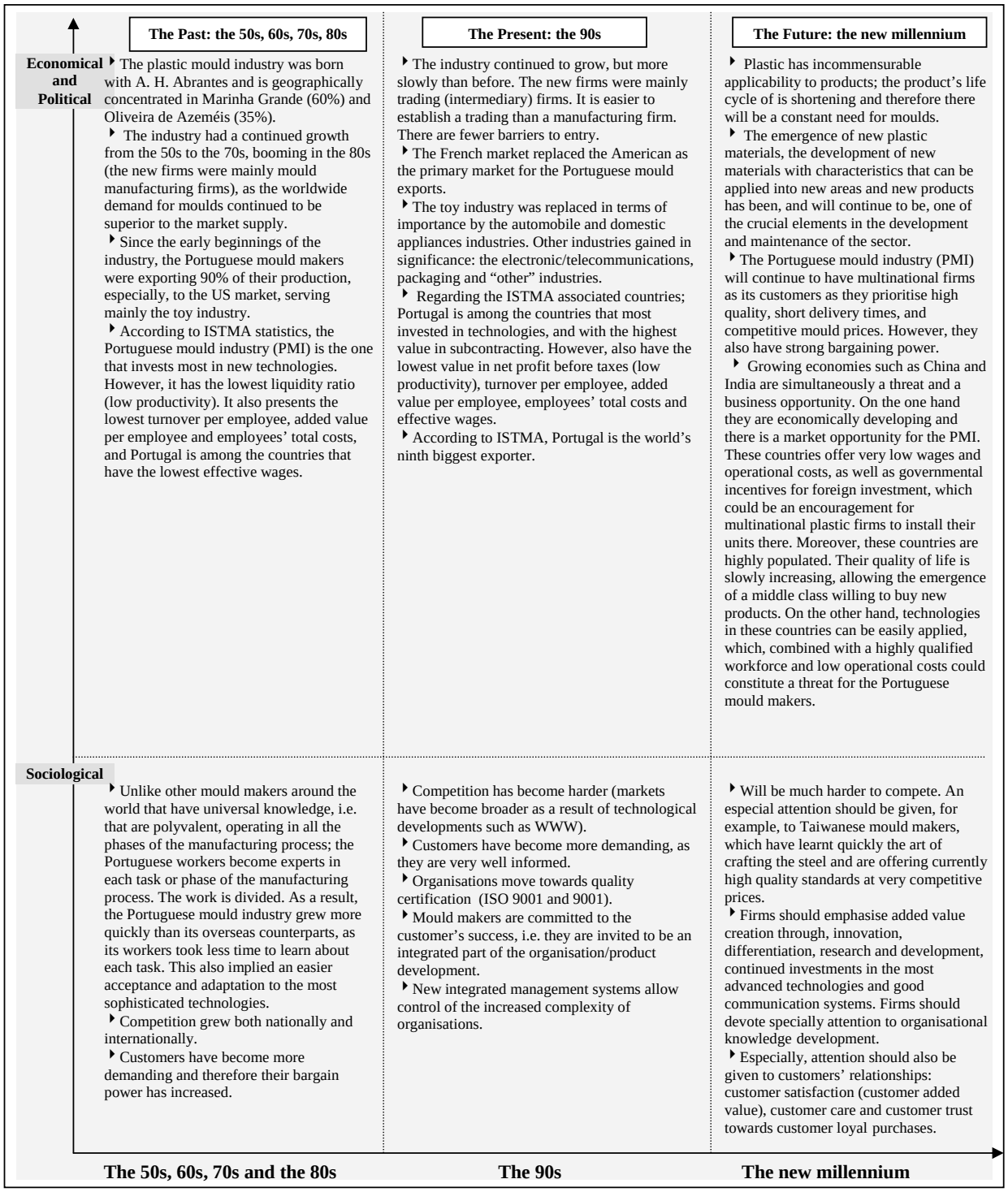
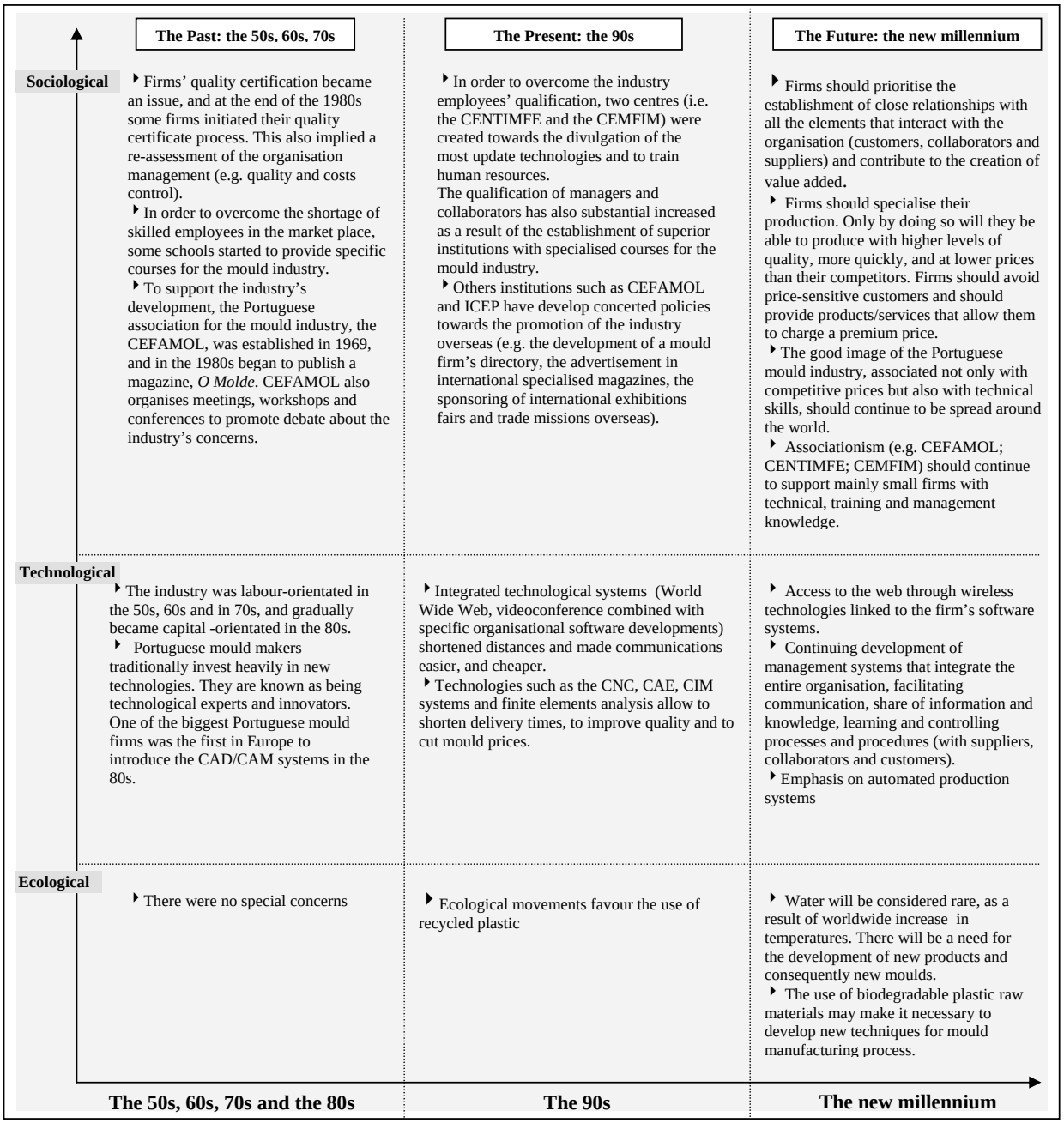


Figure 18 Cont. - The past, present and the future of the Portuguese mould industry, based on the Porter 5 competitive forces



An analysis has also been developed to identify the strengths, weaknesses, opportunities and threats of the industry (see Figure 19).

Figure 19 - The Portuguese mould industry SWOT analysis

Strengths	Weaknesses
- A prestigious international image - High quality moulds at very competitive prices (mainly based on low labour and low operational costs compared with American and European competitors, i.e. 20-30% less). - Relatively short delivery-times - Long-term experience and expertise in the art of crafting the steel - High creativity; enormous capacity to offer mould solutions that others cannot. - Flexibility to adapt to the market's requirements and the changeable environment - High export capacity, which has fostered competitiveness, as they deal with most demanding customers. - Awareness and willingness for innovation and modernisation - Close relationships with both suppliers and customers allowing mutual collaboration, learning and diffusion of new technologies - Constant investments in the latest technologies - High technological expertise: innovativeness in the use of the most sophisticated technologies - High creativity in the product project and manufacturing process - Development of techniques and processes towards quality improvement; quality certifications ISO 9001 and 9002. - High level of planning and quality control - Constant investments in training - High entrepreneurial dynamism: a) Promotion of associationism and cooperation between firms in the sector in order to search for potential and new markets. b) Institutional support (CEFAMOL, ICEP, CEMFIM; and CENTIMFE) towards the development and modernization of the industry - Flexible organisational structure. Small firms that when needed use subcontracting or outsourcing services.	- High dependency on the economies to which the PMMF export - Still a shortage of qualified human resources for market needs (especially to deal with new technological developments, which induces to low productivity levels) - Low levels of investments in Research & Development - High dependency on financial institutions to access capital. Lack of financing alternatives. - Incomplete use of the installed technologies: low levels of productivity compared with their American and European competitors - Lack of specialisation in the organisation domain: the selection of markets-products and/or services to be offered - Lack of organisational management, especially in top management/owners of micro and small firms. Each partner is specialised in one task of the manufacturing process, but lacks management and commercial knowledge. - Lack of commercial aggressiveness. Lack of marketing and international business knowledge to develop systems and procedures, and in the use of resources, to do business internationally - Inconsistency in the budgets for moulds. For the same mould project there is a discrepancy in the prices quoted by the different mould makers, which underlines lack of organisational management knowledge - There is much to be done in order to make the quality of the Portuguese moulds known around the world. - Low bargaining power, especially with multinational customers and well-known components' suppliers. Small size firms compared with their customers or suppliers. - Some firms disregard or are indifferent to the industry's cooperative work (CEFAMOL, ICEP, CENTIMFE, CENFIM, etc) - Delivery times are not always accomplished. - High sectoral wages compared with other domestic sectors. - Succession. Most of the top managers/owners are getting old and hope that their sons or daughters will succeed. Yet, not all wish to continue the family-run businesses. Some firms end up to being acquired by customers or by other mould-manufacturing firms. - High costs of subcontracting if there is no strict cost and quality control.

Opportunities:	Threats:
- Consolidation of the Portuguese mould industry's image. - Growth of plastic products. The enormous applicability the plastic e.g. in the automobile, electrical, electronic, medical, civil construction, and garden industries. - New emergent markets such as China and India. - The appearance of new composites. - New manufacturing techniques aimed at optimisation of levels of productivity. - Optimisation of the installed capacity. - Increasing technological developments: introduction of technologies that allow better use of the raw materials: plastic, glass, aluminium, etc. - Introduction of integrated technologies that broaden markets, turn communications easier and increase organisational effectiveness (know better customers) and efficiency (implementation of integrated management systems towards a rigorous cost control). - Establishment of cooperative networks for the development of products with more value added, both with suppliers (transfer of technological knowledge) and customers (in the development of the product). Enlargement of the value chain, both vertical and horizontal integration. - Emphasis on customer relationships - Sectoral and organisational domain specialisation-differentiation. - Access to information available, mainly produced by institutional organisations. - Infrastructures – a network of contacts that allows the establishment of business relationships and the share of knowledge and experiences (CEFAMOL, CENTIMFE, CENFIM). - Financial support from the III QCA (third Community board support) for the modernisation and internationalisation of the industry.	- Growth of international competition. -The emergence of new competitors from Eastern Europe (e.g. the Czech Republic). They have a tradition in the metal mechanical industry, low operational and employees' cost, access to technology, highly qualified human resources, and are geographically close to European markets, especially Germany. Therefore they will be able to produce moulds of high quality, with short delivery times and competitive prices. - The increasing competition from the Asian Tiger countries such as Taiwan, Hong Kong and Singapore. These countries used to base their competitive advantages mainly on low costs, and the moulds were of relatively simple complexity. However, this situation has changed. These mould makers are currently producing moulds of high quality standards and of an increased degree of complexity at very competitive prices. - The ecological movements may slow down the use of plastic or may pressure firms to use only recyclable plastic raw materials. - Exchange rate policies may prejudice international business relationships.

Having identified the main points of the industry's environmental context, it is now important to define those factors that create or sustain competitive advantage. The following section will review and discuss according to the Portuguese mould manager's understanding, the key competitive factors for sustainable competitiveness.

3.6. The PMMF key competitive factors - A base for sustainable competitive advantage

The aim of this section is to discuss the key competitive factors that create or sustain competitive advantage. Business strategy development results from an interactive process between the organisation and its external environment. In this context, key competitive factors comprise deploying modern technology, creating a skilled workforce, ensuring a good fit between markets and products and effective marketing. It also requires developing a clear understanding of changing customer expectations, the strategic behaviour of competitors, the changing expectations of suppliers and environmental trends.

3.6.1. Business strategy - the organisation's key competitive factors

This section analyses the organisation's key competitive factors. They are technology, a skilled workforce, markets-products and/or services and marketing policy.

3.6.1.1. Strategy is the effective use of technology - a base for sustainable competitive advantage

Portuguese mould manufacturing firms have recognised that technology is an important factor in creating organisational competitiveness. Technology simplifies and accelerates the mould production process, shortening mould delivery time, increasing quality and reducing costs (see J.D.D. *O Molde*, Nº40, 1999 and Luis Godinho, *O Molde*, Nº17, 1992). One of the demands that potential customers make of mould makers is a list of their technology, which indicates whether they have the technological capability to produce the moulds required and whether they have the most up-to-date technology. The mould industry is capital-intensive and becoming more so as the sector continuously invests in technology (see Luis Febra, Socem, *O Molde*, Nº27, 1995).

The technology to support the manufacturing process may include milling, drilling, EDM (Electric discharge machines), wire cutting, laser, quality control and injection test equipment. This equipment may be supported by software systems such as

CAD/CAM/CAE/ CNC [13]. For instance, firms that own an automatic tool change machine run by a CNC software system will enhance their competitiveness by having shortened delivery times with higher quality and reduced costs. Translation software is also an important technological tool in the mould production process and is frequently provided by the Portuguese mould makers (see Neilley, 1998). Portuguese firms are increasingly using visualisation and realisation software[14] that allows the customer, who could be in Japan, to interactively and simultaneously discuss and develop a new product, which is visualised on the screen in 3D. This software also enables both customer and supplier to see each other, thereby increasing trust as customer and producer jointly work on the design and realisation of the product. Additionally the software allows the customer to access continuous information about the development process. This software increases the speed of information and clarity in communication. It increases an organisation's competitiveness by cutting travel expenses and by shortening delivery times. While some firms in Portugal are using this technology, other firm's ability to update their technology may be constrained by the difficulty in accessing capital, constituting a limiting factor for the achievement of firm's competitiveness, especially when interest rates are too high (see SET, SA, in *O Molde* Nº20, 1993). As seen technological developments shorten delivery times, increase quality and costs competitiveness.

Delivery times: Delivery time is recognised by the Portuguese mould makers as being one of the most important factors for customers in their purchase decision-making (João Faria Gomes da Silva, *O Molde*, Nº23, 1994) and shorter deliver times is one of the key factors to achieve firms' international competitiveness (Henrique Neto, *O Molde*, Nº49 and Nº50, 2001). The sooner the plastic firms have the mould, the sooner they can start to produce the product and consequently sell it. Therefore, plastic firms

[13] CAD – Computer Aided Design; CAM - Computer Aided Manufacture; CAE - Computer Aided Engineering; CNC – Computer Numeric Command.
[14] See Henrique O'Neill from the ADETTI/ISCTE, DCTI- Information Technology and Computer Science Department. He has led a project, the COMCOOPLAS project, (1999) which consists of the development of software to give accurate manufacturing response architecture for the mould industry. The COMCOOPLAS - Communication and Co-operation in the Plastic Mould industry.

look for mould makers that produce moulds in the shortest possible number of weeks. As one of the Portuguese moulding managers explained:

> "delivery time for certain customers is much more important than price and customers are willing to pay a premium price to have the mould earlier. I remember that once we were producing a mould for a car battery. Suddenly the customer visited us and asked me to do whatever was needed to hurry up his mould delivery time. He said that money was not an issue. The reason was that he found that his competitor was developing a new car battery, and he wanted to put his battery in the market place before his competitor".

So, delivery time is a key factor in sustaining and generating organisational competitiveness. However, achieving agreed delivery times is often difficult especially when mould makers are serving the automobile industry. These clients are constantly re-designing their products, which imply changes in the mould specification. Alterations to the mould will affect production at all stages, compromising the achievement of delivery times for other customers, as well as delaying payments. It is only when the automobile manufactures are ready to start mass production that they accept the mould delivery and are prepared to pay. For these reasons, some firms have started to avoid the automobile industry as a client.

Quality: Quality is also an important factor in a customer's purchase decision-making (see Virgílio A. Cruz Machado, and António Ramos Pires, *O Molde*, Nº17, 1992), and it is one of the key competitive factors offered by the Portuguese mould industry (see Grupo Simoldes, *O Molde*, Nº29/30, 1996, and Moldite, SA, *O Molde* Nº34, 1997. According to Rob Neilley, (1997) the excellent quality of Portuguese moulds is a key element, which underpins the competitiveness of the sector[15].

Price: Portugal is very competitive on price compared to European and American competitors (see Table 4). As stated by the PTC team leader, Steve Spanoudis , "When Lexmar's Plastics Technology Centre (PTC) in Lexington, Ky., placed an order for 27 moulds with a collection of seven Portuguese mould makers over two-year period, the

[15] see http://www.centimfe.com/archive/mp98/mp98.hml

tooling prices totalled 20-35% less than they would have cost in the U.S (see Ogando, 1998). However, cost differentiation, especially based on low labour costs advantages are being offered by increasing competition from Taiwanese, Chinese, Korea and Hong Kong. Dan Elliot, a procurement engineer for Hewlett-Packard, and Dan Furlano, a technical manager at General Electric plastics, solicited quotes for an inkjet-printer enclosure from 19 mould makers in the U.S., Asia, and Europe which were seen as high-quality tool shops (all of them have been qualified as potential suppliers to Hewlett-Packard). The benchmark study concluded that the price differential arose from low labour costs in which Taiwan, China and Korea present the lowest values (Ogando, 1998).

As we have seen, Portuguese mould makers are constantly updating their technology (in order to achieve high quality standards, shorter delivery times and competitive prices). The mould industry is capital-intensive. It is therefore important to achieve high technology capacity utilisation and consequently high productivity levels. However, the industry has low levels of productivity (see J. Figueiredo, *O Molde* Nº14, 1991, and António Selada, *O Molde* Nº40, 1999). Having the technology working 24 hours a day, by working in shifts and having high automation ratios (number of equipment controlled by the number of employees) is a mean of achieving high technology capacity utilisation and therefore high productivity levels (see Henrique Neto, *O Molde* Nº25/26,1994). The low levels of productivity of the industry are a general concern, and insufficient qualified workforce for the industry needs, is the underlined reason (see Paulo Pinto, *O Molde* Nº43, 2000). Having knowledgeable workforce to work with technology is essential to generate value added.

3.6.1.2. Strategy is a skilled-knowledgeable workforce - a base for sustainable competitive advantage

It has been acknowledge that a skilled workforce is a key competitive factor and one that is particularly relevant to the Portuguese mould industry (see Grupo Simoldes, *O Molde* Nº29/30, 1996 and João Lopes, *O Molde*, Nº40, 1999). It is vital that organisations recruit qualified employees, as well as constantly upgrading their workforce through training (Manuel Oliveira, 2000). Portuguese mould makers ran

into debt in the rush to update their technology, yet some of it remained unused for months because workforce development and training issues were neglected in their decision-making. The workforce was not prepared to deal with the newly acquired technology. Firms may have the steel and the technology, but they need knowledgeable workforce to shape the steel into moulds. Recent research findings show that one of the Portuguese mould makers' main concerns is the shortage of a skilled workforce to operate the new technology. Sousa (1997) investigated the diffusion of technological innovation in the mould and cloth industry and its implications for business performance. In the mould industry, her research was based on an empirical study of 25 manufacturing firms and, using factor and discriminant analysis, she concluded that employees did not have the knowledge to deal with the newly acquired technology, which was confirmed by the low level of investment in training. Her findings showed that the adaptation process of implementing new technologies was inhibited by the high investment in equipment and the shortage of skilled people to operate it. Marrazes (1997) corroborated Sousa's results and he argued that technological investments were not yielding profits, due to the lack of training and a skilled workforce.

Marrazes (1997) analysed the competitive challenges of productivity, and competency development in industrial management. He used anecdotal information in one case study of a mould manufacturing firm. He concluded that the moulding firms' competences are based on knowledge especially in the production process. He also revealed that investments in technology did not increase organisational competitiveness, i.e. the organisation was short of implemented systems based on management and employee training policies to prepare people to take advantage of the newly updated technology. Gomes (1998) corroborated Marrazes's (1997) point of view, however, he added that technology modernisation should involve the entire organisation's activities if is to be effective.

Gomes (1998) explored generic strategies, and innovation based on post-hoc identification at the corporate level. He recognises a "technology for the moulds", which is associated with long-term experience in making moulds, new technological

developments, and complex productive operations. He added that the modernisation effort that companies aim to achieve cannot be based solely on the acquisition of new technologies. It should be accomplished by improvements in all organisational activities and it should be implemented especially with training policies that prepare employees to take the best possible advantage of the equipment and therefore yield the highest levels of productivity. Lopes (1998) emphasised the importance of workforce training for potential the use of technology.

Lopes (1998) studied the production process of the mould sector in a survey of 17 firms. Her findings showed that the industry was characterised by continuous technological developments, forcing organisations in the short term to update their equipment. She concluded that to increase organisational effectiveness, managers should promote employee training schemes in order to secure the highest equipment productivity as well as tight cost control systems. Through the years there was a global effort (including moulding firms and governmental institutions) towards to eliminate the shortage of a skilled workforce for this industry. However, mould makers still identify it as a problem: technologies change very quickly and the market place is constantly overwhelmed by new technological developments. Consequently, firms must assure training to ensure competitiveness (see António Sá, *O Molde* Nº14, 1991, and Henrique Neto, *O Molde* Nº15, 1992).

However, besides the identified shortage of a qualified workforce for market needs, the PMMF are recognised worldwide for its skills in the art of crafting moulds, especially their expertise in the mould design and in the mould manufacturing process (see III Congresso da Indústria de Moldes, 1989; IV Congresso da Indústria de Moldes, 1992). Their competitive advantages are based exactly on that: their accumulated experience; their know-how in the art of crafting the steel; their creativity in producing the moulds required by customers, and their shared culture and commitment in obtaining ingenious solutions. It has been the capacity of the Portuguese mould makers in combining several key competitive factors that has allowed them to create different product and services and to compete in more demanding markets and industries.

3.6.1.3. Strategy is the organisation's domain: markets - products and /or services - a base for sustainable competitive advantage

For the PMMF, a mould represents a customer, and therefore a market to which they are exporting. Certain markets are more demanding than others and firms that sell to the most demanding markets, such as the German one, have to develop their own competitiveness. As a mould maker said: "in general, we sell *technical* moulds to Germany and France, and *commercial* moulds to the USA[16]". Commercial moulds are moulds that serve mass production and consumption while technical moulds are those which embody a high skill and high value added element. Thus the market and customer alignment of companies directly affects the firm's degree of specialisation and the way it perceives its own competitiveness.

In the mould industry the product is produced according to strictly defined customer's requirements. The mould is customised, tailored and personalised to each customer. Competitiveness is therefore, rooted not in the production of new products but in the development of new manufacturing and organisational processes that meet customers' needs (i.e. processes and technologies that shorten delivery times, increase quality and cut prices). In order to achieve this, the PMMF has increasingly specialised and differentiated mould production (Henrique Neto, *Fortunas e Negócios*, Nº84, 1999). Many firms have realised that they needed to enhance their strategic capacity and be more intelligent in the way that they think through issues about the degree of product and market specialisation and how they can differentiate their products and value added services from competitors within and from outside Portugal. As we shall see in a later chapter, this has caused many firms to jettison product markets such as toys; to enter more technologically demanding sectors and to move their business within the value chain.

While in the past Portuguese mould makers would have accepted any commission to manufacture a mould, increasing global competition has led the sector increasingly to specialise their product and to differentiate their production (see Grupo Simoldes, *O*

[16] In interview with Joaquim Martins, Famolde, 2001

Molde, Nº29/30, 1996). This move to specialisation-differentiation has had many ramifications within the firm: firms have had to more consciously choose the product-markets in which they wish to operate; to adopt new technologies; to market themselves better; to reconsider the capacity and complexity of the manufactured mould; and to develop additional services that complement the manufactured mould.

The move to specialisation-differentiation is also a self-reinforcing process. For example, a mould for a T.V. requires certain design specifications and once this has been developed for one customer, it enables the company to prospect for new companies who might also wish to purchase moulds for T.V.s or products similar to it. An organisation's expertise is therefore, developed around those similarities in each single class of products. Those products could be laptops, phones, kettles, microwaves, vases, garden chairs, car air conditioning, car windscreens or even car bumpers. Firms that have a history of manufacturing a certain number of similar moulds every year (e.g. moulds for car batteries) are thus better positioned to produce car batteries in shorter delivery times of a better quality and at lower prices than those mould makers that produce a whole range of moulds for any industry.

Specialisation-differentiation requires firms to reconsider their positions on the capacity and complexity of the moulds to be manufactured. Capacity and complexity specialisation of the manufactured mould will do much to determine the strategic positioning of firms and to affect their competitiveness. Within the industry the choice of the capacity and the complexity of the mould manufactured is an organisational choice for serving particular industries. Mould makers serving the automobile or garden furniture industries may produce large moulds of moderate complexity. Firms targeting the electric/electronic industry may produce small capacity moulds of high complexity and firms serving the domestic utilities industry may manufacture moulds of medium capacity and moderate complexity. Table 5 and 6 illustrate the degree of capacity and complexity of the manufactured mould.

Table 5 - The capacity of the manufactured mould

Small moulds	Up to 1.999 kg
Medium moulds	2.000-4.999 kg
Large moulds	5.000-9.999 kg
Very large moulds	Over 10.000 kg

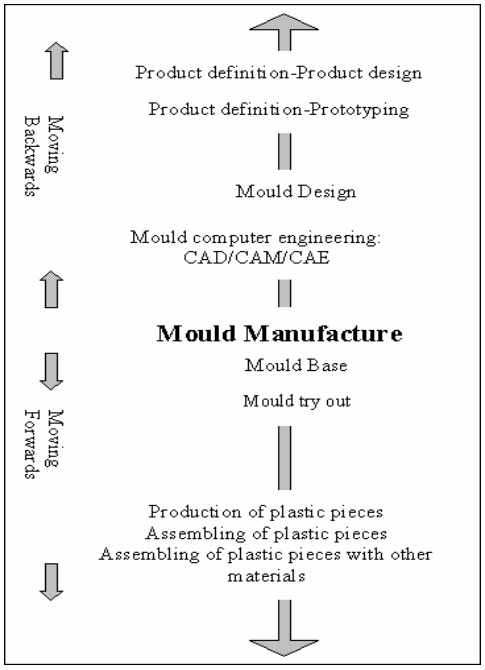
Table 6 - The complexity of the manufactured mould

Simple complexity moulds
Moderate complexity moulds
High complexity moulds

Therefore, firms that offer customers the full range of manufacturing capacity and complexity may not achieve competitive advantage in any degree. The choice of capacity and complexity also implies the selection of specific technologies. Those firms that will manufacture any type of mould may need to have at their disposal a diversified technology - this disperses their efforts and they are unlikely to attain the competitiveness achieved by firms that specialise in defined product/market segments. Firms that have equipment for manufacturing large moulds can also manufacture small and medium moulds, but the technology for manufacturing large moulds is very expensive and manufacturing small and medium moulds with it will not allow the organisation to recoup its heavy investment. Firms cannot simply price small and medium capacity moulds as large capacity moulds because they would lose their competitive edge over other companies who had specialised in a given segment.

In order to increase specialisation-differentiation, firms may also offer a variety of services alongside the product (i.e. product augmentation) to increase customers' value added. The PMMF may offer their customers a full range of services such as: a) support with product definition (product design and product prototyping); b) mould design; c) mould computer engineering (e.g. CAD/CAM/CAE); d) the production of the plastic pieces; e) the assembly of the plastic pieces; and f) the assembly of plastic pieces with other materials (see Figure 20). Firms may move either backwards or forwards or both in their organisational manufacturing process.

Figure 20 - Organisational services- Product augmentation, enlargement of the organisational process



The selection of the organisation's internal configuration is about the degree of specialisation-differentiation of the markets to which firms sell, the capacity and complexity of the manufactured mould, the industries served and the development of services offered alongside the manufactured mould that will enhance customer value added. Additionally, to generate or sustain competitiveness, firms tend to strengthen their marketing policy. The search for customers involves a dynamic and aggressive marketing attitude from firms (Hugo Coimbra, *O Molde*, Nº27, 1995). Firms may open branches overseas, have overseas agents or sell through intermediary firms either in Portugal or abroad. Firms may also strengthen their promotion policy: they may choose to advertise in specialised magazines, to hold workshops, to participate at international exhibitions, or send mailings to their customers (see M.D.A. in *O Molde* Nº28, 1996). Effective commercial and marketing policies result in regular customer orders (bringing financial stability), and beneficial contract conditions that prevent firms from surprises (Henrique Neto, *O Molde*, Nº49).

Competitive advantage is associated with the organisation's resources and the development of internal competencies (i.e. technology, a skilled workforce, markets-products and/or services, and effective marketing policies. Consequently, as was argued in the literature review, the organisation must be seen as a whole system that constantly interacts with its external environment. The analysis of the organisation's external environment key competitive factors comprises its customers, competitors, suppliers and environmental trends - these are discussed below.

3.6.2. Business strategy - key competitive factors of the organisation's external environment

The aim of this section is to analyse the organisation's customers, competitors, suppliers and environmental trends.

3.6.2.1. Strategy is the creation of customer value - a base for sustainable competitive advantage

Customers for moulds can arise from many industries and the demand for moulds is increasing with the development of new products in many fields, more and more products are made of plastic. Increasingly, firms are looking to develop more complex products, which require more complex moulds. The PMMF serves mainly industries that require highly complex and technologically sophisticated moulds. As the consultant Agostino von Hassell of Repton Group LLC stated[17]: "Portugal's strength is in high-tech moulds". This type of moulds requires know-how and expertise to be manufactured - this is one of the PMMF's key competitive advantages. The sector's customer base makes their decision to purchase on a blend of criteria including quality, delivery time and price. As Martin Burnell of Denso Manufacturing U.K. said " Japan was impressed with the quality of the Portuguese moulds"[18]. Agostino von Hassel from the Repton Group stressed that the quality of the Portuguese mould has not surprised him as "no other country in the world has developed so much training as

[17] see Agostino von Hassell, "Portuguese mould makers increase exports", *Plastics News*, March 23, 1998
[18] see http://www.centimfe.com/archive/mp98/mp98.html

Portugal has done" (for further details on the Portuguese mould maker's customers, see appendix 2I).

The PMMF has established close relationships with their customers and that collaboration has allowed the creation of value added and competitive edge. According to S&L's Tomko, "the key is building a relationship with a good supplier who understands exactly what you want". S&L has found reliable offshore suppliers in Portugal and in Asia[19]. Customers that have short lifecycle products are constantly improving and renewing their product design and are thus in permanent need of moulds. This is a potential opportunity for mould makers to develop trust-based, and long-term relationships with their customers. It is important also to emphasise that there are customers that define norms, specifications as well as the brand of the components to be used in the mould manufacturing process (this is the case of *Incoe* for hot injection channels).

3.6.2.2. Strategy is understanding the organisation's competition - a base for sustainable competitive advantage

The PMMF is competing worldwide. Managers have a general idea of where their competitors are located, what they are doing and what they can (or cannot) do better than them. The acknowledgement of competitors' strategic behaviour allows the development of competitive strategies. Competition comes from Europe (mainly Italy) if customers emphasise the combined strategic factors of delivery time, quality and price; from Eastern Europe (mainly the Czech Republic (see Doug Smock, *O Molde*, Nº24, 1994); and from East Asia (mainly Taiwan and Hong-Kong) if price is the key competitive factor (see João Faustino, *O Molde*, Nº22, 1993). Further details of Hong-Kong's mould makers and the key strategic factors of competition can be seen in appendix 2J. Italian mould makers are the PMMF's most important competitor: wherever the PMMF are chasing a customer, the Italians are there as well competing with them[20]. In order to understand the strategic behaviour of competitors, the ICEP (Investments, Trade and Tourism of Portugal Institute) has been conducting analyses

[19] see Joseph Ogando, "Offshore Mold", *Plastics Technology*, April, 1998
[20] In an interview with Paulo Pinto, Simoldes, 1998.

of the international market for moulds (ICEP - Moldes, Portugal e os Mercados Internacionais, 1999).

3.6.2.3. Strategy is the analysis of organisation's suppliers - a base for sustainable competitive advantage

The PMMF suppliers include the steel companies, technology companies and those firms to which the PMMF subcontract services to complete the mould manufacturing process. The establishment of a close relationship between suppliers and the PMMF helps suppliers to understand the real needs of the PMMF. Indeed, a supply chain exists within the industry. The steel industry is a key up-stream link for the sector as the moulding industry requires steel of high quality. Subcontracting is also common within the PMMF and a range of firms supplies services and sub-assembly functions within the sector. As technology is becoming more sophisticated, most of the PMMF do not have all the technology necessary to complete the mould manufacturing process, or if they do, this may be overloaded. Consequently, complex sub-contracting relationships have emerged.

Subcontracting could involve just one phase of the manufacturing process (e.g. product design or CAD/CAM/CAE) or parts of the mould or, in some cases, the complete mould. Subcontracting gives organisations technological flexibility, it fosters the organisational performance by limiting the technologically-driven financial risks, it boosts specialisation and it increases organisational and sectoral cooperation (see Fernando Pedro, and Henrique Neto both, in *O Molde*, Nº41, 1999). However subcontracting has also its downside as firms have reported that it can cause delays in delivery time; quality control becomes more difficult as the firm that is subcontracting does not have control over the subcontractor who may be more interested in profit than quality (see Fernando Pedro in *O Molde*, Nº41, 1999). Nevertheless, the way that a firm decides to develop subcontracting relationships and to integrate itself within a supply chain is a key strategic decision that will affect the overall competitive stance of the business and, ultimately, its performance.

3.6.2.4. Strategy is the organisation's environmental trend analysis (Economic, political, sociological, technological, and ecological) - a base for sustainable competitive advantage

Firms must achieve and maintain a high level of fit with their environment and as their environment changes, so too must their strategy. Elsewhere in this chapter, the key trends that have affected the sector have been outlined. These changes have involved considerable economic change such as currency fluctuations (see Luis Filipe Cardona, *O Mo*lde, Nº16, 1992); political change such as Portugal's accession to the EU which created new market opportunities for the PMMF; customer attitude changes as customers have become more demanding; technological change as moulds have had to be developed to meet the challenge of new products; global change as communications have become easier, distances have shortened and markets have broadened; and ecological change which has forced manufacturers to move to biodegradable plastics which require more sophisticated manufacturing processes.

Over the last twenty years, Portuguese mould making firms have had to adjust their strategies in the light of these many and complex changes.

3.7. Conclusions from the environmental context of the Portuguese mould industry

The aim of this chapter was to gain an in-depth understanding of how the Portuguese mould industry has evolved; to identify the factors that have affected its evolution and to isolate those factors that have impacted upon the strategies that these firms have had to develop. In order to develop and sustain competitive advantage, firms have had to respond to and anticipate change, and it is clear that the Portuguese moulding sector of the 1990s had changed considerably from that of the 1960s. The fact that many new firms have been created over the period and that they still exist today is testament to the fact that many have adjusted their strategies successfully and have learnt to co-exist with their environment.

The analysis has revealed several key points. The industry is geographically concentrated in two major centres (Marinha Grande and Oliveira de Azeméis) and a

network of complex relationships between firms, their suppliers and their sub-contractors has developed. The sector focuses on exporting with 90% of production being sold abroad. There is a long tradition of a skilled workforce as many entrepreneurs left long-established firms to establish their own firms, which are overwhelmingly SMEs.

Since the period of initial growth, firms have learned that they must specialise and differentiate to survive and this was in response to the changing demands of the environment of these companies. There were significant environmental changes from the 80s to the 90s. In the 80s new technological developments changed the way that moulds were manufactured (e.g. the first CAD/CAM systems); the industry boomed as national and international economic conditions have favoured its development but as conditions changed geographical and sectoral markets changed - as did the technological sophistication of the product.

In the 90s, competition has increased, and new technological developments have changed the way firms do business. Markets broadened and customers became more demanding - this required a tighter control of resources, quality and cost. In the late 90s, Germany and the French market became more predominant at the expense of exports to the USA. As demand from the toy industry declined and markets were lost from competition from low cost economies, attention changed to the automobile and domestic appliance sector.

Increasingly, these factors mean that firms had to pay more attention to the process of business strategy development. Firms had difficult choices to make. Which markets and sectors should they seek to enter? On what should they compete - quality or price? Should they stay generic or specialise into niches? What should firms do in terms of complexity? Should they move to a more value added product? Should they focus on the whole process or specialise within it? How should they market and promote themselves? How should they engage with their competitors? How could they anticipate changes in the external environment? Should firms augment their product by offering a layer of additional services? How should firms adopt new technologies?

How should firms engage with innovation? How could firms maintain an acceptable level of performance?

All these questions require answers and these answers had to be provided by the managers and owners of these companies. The answers to these questions would determine the strategic stance of businesses and from these stances behavioural pattern would emerge. In the literature review chapter, considerable effort was applied to trying to define patterns in the strategic behaviour of firms. In this chapter we have treated the Portuguese mould manufacturing sector as homogeneous: but, it is not. Different firms in the sector will have answered the above array of questions differently; they will have adopted different strategic stances and they will have revealed different behaviours. They will have also performed differently.

The central theme of this research is to explore how firms behave in response to environmental change; to identify patterns in the behaviour of firms and to explore if performance is determined by the adoption of different behaviours. In the next chapter, the detailed set of hypotheses and research questions that have been derived from the literature review and that will be tested are set out.

CHAPTER 4

The Conceptual Framework and the Research Hypotheses

4.0. Introduction

Based on the literature reviewed this chapter attempts to produce a conceptual framework that integrates the Miles and Snow's strategic typology, business strategy development, the dynamics of strategy and organisational performance in Portuguese mould manufacturing firms. The conceptual framework will then be used to provide a context for the development of a series of hypotheses, which will be tested in a later chapter.

This chapter comprises three main sections. The first section describes and discusses the conceptual framework. It draws together an understanding of how firms develop their strategies through the analysis of the organisation's resources and competences and the assessment of the organisation's external environment. The framework has a time dimension as it also incorporates how strategies evolve over time and the pattern of strategic change. In addition, the framework includes a component that examines organisational performance in the context of business strategy. The second section is based directly on the literature review and it puts forward a specific set of hypotheses that will be tested in the data. The third section concludes the chapter by assessing the contribution of the conceptual framework and the hypotheses in the context of the broad aims of the thesis.

4.1. The conceptual framework

The aim of the conceptual framework is to provide a medium that will aid our understanding and explanation of the inter-relationships between business strategy development, the dynamics of strategy and organisational performance, and in which way the four Miles and Snow's strategy types (Defenders, Prospectors, Analysers and Reactors) differ in their

strategic behaviour. The conceptual framework provides a simple, clear and holistic view of these inter-relationships. The conceptual framework is split in two elements. First, it illustrates the above relationships in "static mode" (using a cross-sectional perspective) and, secondly, it interprets them in "dynamic mode" (using a longitudinal perspective).

The process of business strategy development for the Portuguese mould industry, comprises the analysis of the organisation resources and competences and as well as the analysis of the organisation's external environment. Therefore, business strategy is about managers making choices in the following areas:

- The nature of the organisation's domain - product/service and markets: the complexity and the capacity of the manufactured mould, the markets the firm chooses to serve and the services that offers (service-product augmentation: whether it augments the manufactured product with services).
- Marketing policy: how firms deal with their customers (directly, through intermediaries, agents or branches) and the way they chose to promote themselves (advertise in specialise magazines, do workshops/seminars/conferences, participate in trade missions, attend international exhibitions fairs or send mailings).
- Investment policy: how firms invest in R&D, technology, infrastructure, marketing, customer relationships and training, and firms constraints on investment
- Technological profile: in which technologies firms will invest, the time-cycle of technology re-engineering and effective technology deployment (working in shifts-capacity utilisation and automation ratio).
- Organisation size and workforce development: (the firm's employment structure and training investments).
- Organisational management capacity: identification of strengths and weaknesses (quality certification, organisational structure, strategic management, strategic planning, strategy implementation, information feedback, centralisation, decentralisation, simultaneous engineer process, or innovation)

In addition to this, managers will need to have a robust understanding of:

- Customers and their needs: the customers' benefits offered in terms of quality, delivery time, price and technology expertise, among other factors.
- Customer relationships and customer loyalty.
- The competition: where they are, on what grounds they are competing; what they are doing better
- Suppliers and subcontracting: knowing the strengths and weaknesses of suppliers, knowing what to subcontract and to whom; and understanding the firms position in both the value and supply chains.
- The changing global environment: identification of opportunities, threats and uncertainty.

Each of these "decision areas" has been built into the conceptual framework, which is included as Figure 21.

However, in addition to this, managers will need to be aware of how their companies are performing. Managers will need to be able to reconcile the above set of strategic issues about positioning themselves in certain product-markets, about selecting appropriate technology and making strategic investments while, at the same time, securing the survival and growth of their companies. It is here that the core assumption of the Miles and Snow's typology of strategic behaviour becomes important: the typology contains within it, the assumption that firms within a given sector will adopt "patterned behaviours" in the way in which they develop and maintain their relationship with their environment. The literature review identified that each of the four categories will display different patterns of strategic behaviour in the way that they position themselves in product-markets, deploy technology and that managers in those business will structure and run them. Essentially, the strategic and operational philosophies of the four different types of company defined by Miles and Snow will differ. There is also an assumption that different type of firm will perform differently. The aim of the conceptual framework is thus to portray and explain differences in strategic

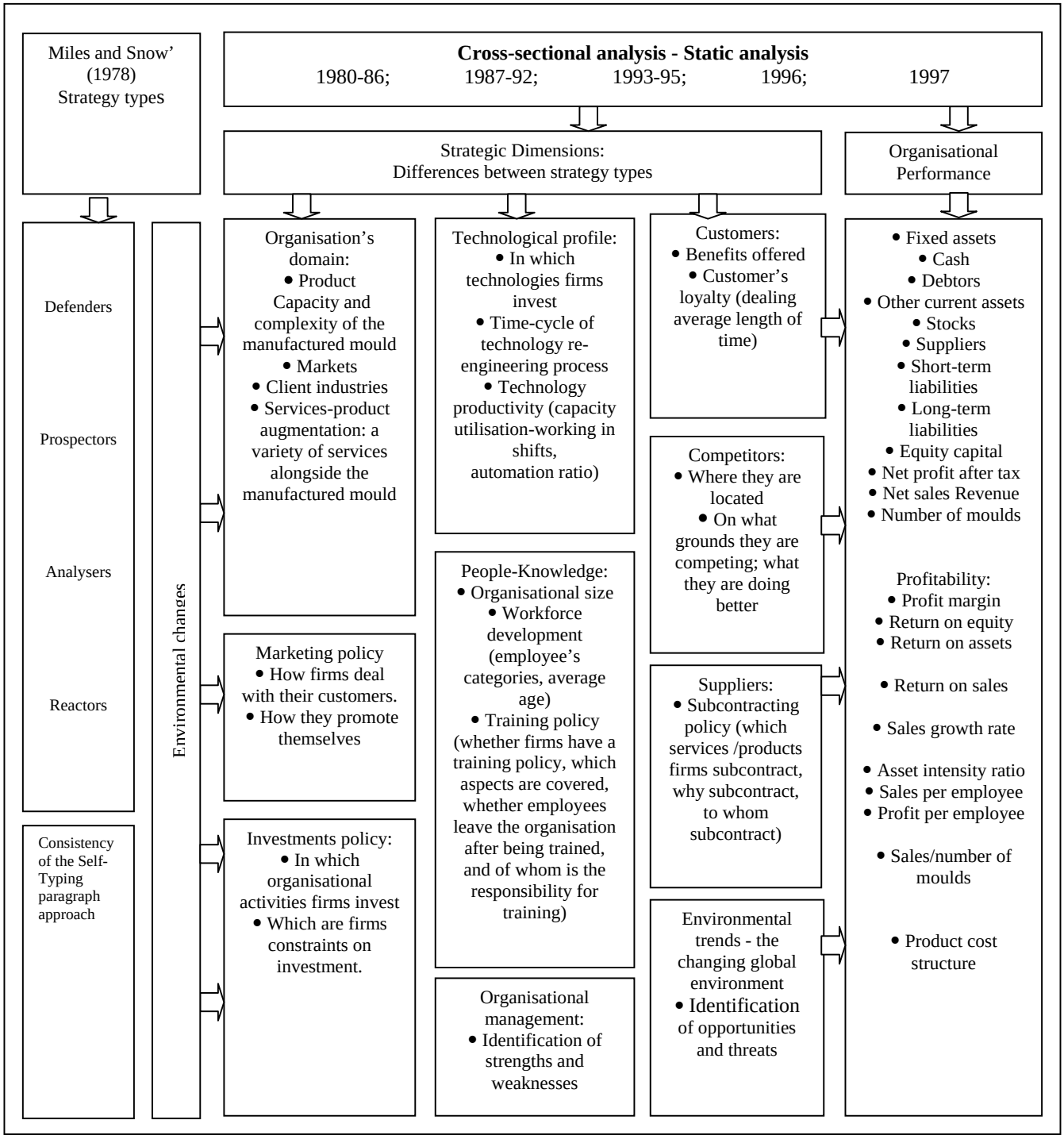
behaviour in the context of the Miles and Snow approach and examine if different strategic behaviours are associated with different levels of performance. The conceptual framework comprises a set of organisational performance measures:

- Balance sheet indicators (fixed assets, cash, debtors, other current assets, stocks, suppliers, short/long-term liabilities, equity capital, net profit after tax, net sales revenue)
- The number of moulds produced
- Profitability ratios (profit margin, return on equity, return on assets)
- Sales ratios (return on sales, sales growth rate)
- Asset intensity ratio
- Employee ratios (sales per employees, profit per employees), and
- Sales revenues per number of moulds.
- Product cost structure

The above measures of business performance and the strategic types defined by Miles and Snow are also encapsulated with the conceptual framework (Figure 21).

The framework presented in Figure 21 takes a comparative static view, and the analysis to test the robustness of the framework, will be undertaken in “cross-section mode” looking at discrete time periods. As the environment changes, or customer needs change, or the basis of competition changes, or firms do not achieve levels of performance that are perceived as acceptable, firms may (or may not) decide to change their strategy. In the Miles and Snow context, they may decide to change from one pattern of strategic behaviour to another. Consequently, it is important to take a more dynamic view of strategy and to examine how firms’ change their strategies over time. It is here that the analysis needs to move from “cross-sectional mode” to “longitudinal mode” and that the time-series aspect of the data set will be exploited.

Figure 21 - The conceptual framework: static perspective



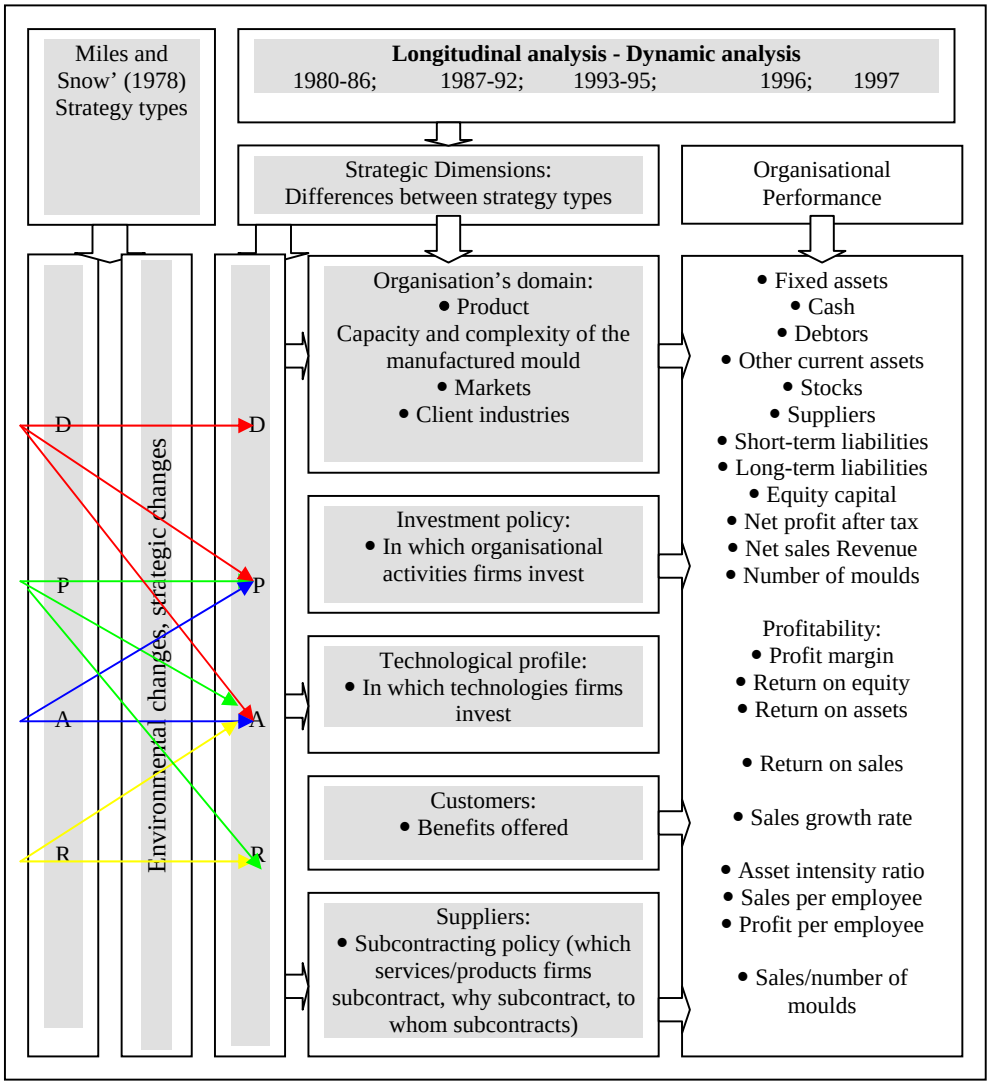
From the literature review, it was found that few studies that had used the Miles and Snow approach had taken a longitudinal view and, consequently, this research has, as one of its aims, to develop an understanding of the dynamics of strategy by looking at how business strategy has evolved over time. It is important to identify if firms have maintained their strategy, have made minor adjustments to their strategy or if they have made more radical changes by moving from one pattern of behaviour to another. As a secondary set of objectives, the research will explore the pattern of strategic change and identify whether firms tend to move from one specific strategy type to another.

Additionally, the research will test if different patterns of behaviour are dominant in different economic and market contexts: e.g. was one type of behaviour "optimal" in the 1980s when market conditions were relatively stable and is another type of behaviour optimal in a world characterised by more aggressive competition. Given the richness of the data, the study will be able to test questions such as: do Defenders remain as Defenders or change to Prospectors or Analysers (or any permutation)? Do Analysers remain as Analysers or change to Prospectors? Do firms change their type more than once?

While it will be enlightening to analyse how firms have changed their behaviours over time, it will also be important to try to examine if firms that change their behaviour from one pattern to another perform better than firms that do not change their strategic type (or vice versa). From the review of the literature, only very few studies have test these issues empirically. These more dynamic issues have been incorporated into the conceptual framework as shown in Figure 22.

Having developed a conceptual framework a series of hypotheses, which have been derived from the literature review, are set out below. The following section articulates and discusses the specific hypotheses that the data analysis chapter will address.

Figure 22 - The conceptual framework: dynamic perspective



4.2. The research hypotheses

As Namik (1989:73) stated, "strategic typologies need to be tested for validity and usefulness through empirical investigation". In order to advance knowledge in the field of strategic management and to help managers to make effective strategic decisions, the typology needs further development and testing. The hypotheses developed in this section attempt to test the applicability of Miles and Snow's strategic typology, their dynamics of strategy and the

overall inter-relationships with organisational performance to the Portuguese Manufacturing mould firms. Five main hypotheses have been developed.

4.2.1. Exploring Miles and Snow's strategic typology from a static viewpoint

As suggested by Miles and Snow (1978), the four strategy types can be identified in any given industry. They also hypothesised that Defenders, Prospectors, and Analysers would be distributed about equally and that they would far outnumber Reactors. Snow and Hrebiniak (1980) also tested this assumption. Therefore the H1 hypothesis is as follows:

> *H1. The Miles and Snow's typology of business strategy is applicable to the Portuguese mould industry.*
>
> *H1.1. Defenders, Prospectors and Analysers are about equally distributed and outnumber Reactors for the periods analysed (i.e. 1980-86, 1986-92, 1993-95, 1996 and 1997).*

In the section below, a series of assertions will be made, drawn from the literature, about how the four different types of firms will differ from each other. According to Miles and Snow (1978:29) "Defenders are organisations, which have narrow product-market domains…(and) do not tend to search outside of their domains for new opportunities… [conversely] Prospectors are organisations, which almost continuously search for market opportunities, and they regularly experiment with potential responses to emerging environmental trends. Analysers are organisations, which operate in two types of product-market domains, one relatively stable, the other changing. In their stable areas, these organisations operate routinely and efficiently…in their more turbulent areas, (they) watch their competitors closely for new ideas and then they rapidly adopt those which appear to be the most promising. Reactors are organisations in which top mangers frequently perceive change and uncertainty occurring in their organisational environments but are unable to respond effectively."

Defenders have a stable set of products and customers; a narrow and stable product-market domain, which they tend to aggressively maintain ignoring developments outside it.

Therefore, it will be expected that Defenders maintain their capacity and complexity of the manufactured mould, markets, and client industries. Related to marketing policy, they will deal mainly with intermediaries and promote themselves by participating at international exhibitions. Their investments policy will be concentrated on technology and infrastructures. They will perceive high interest rates as constraints on investment. According to the theory, they offer higher quality, and lower prices (as a result of the economy of scale effect) than counterparts. Therefore, it is expected that they will be large firms. As they strongly emphasise technology is expected that they will have less qualified workers and lower labour costs than Prospectors. They will not emphasise training policy as much as Prospectors.

As suggested by Miles and Snow (1978), Defenders are efficiency-oriented organisations and they work continually to improve business efficiency even further. One way to achieve this is through technology cost efficiency. Consequently, they tend to invest in a single core technology. As a result, it is expected that Defenders will invest more in CAD/CAM/CAE and CNC systems and EDM equipment than Prospectors. They will have shorter technology time-cycles re-engineering processes as well as higher technology productivity (higher capacity utilisation-working in shifts, and a higher automation ratio are signals of their efficiency-orientation).

In order to ensure efficiency Defenders maintain a strict control of resources. Consequently, they have highly specialised and formalised organisation structures. As a result, it is expected that Defenders will see strategic planning, centralisation, organisation structure, and quality certification as their organisational management strengths and succession as a weakness. Defenders will offer low prices, high quality, short delivery times and high technology expertise as a customer benefit. The average length of time in negotiating deals will be longer than Prospectors. They will state that their competitors will be mainly located in the national market. They will acknowledge that competitors do something different and unique and that they “score higher” on innovation, variety of services offered, marketing-trading policy and simultaneous engineering process. They tend to subcontract mould design and mould testing and they subcontract because they do not own the technology or the service or product is

casual. They subcontract to national mould companies and other sectors. Regarding environmental trends, Defenders will identify intermediaries-trade firms and as a threat.

Conversely, Prospectors grow through product-market development. Therefore, it will be expected that Prospector's continuously search for new product-market opportunities in different countries and different industrial sectors. They will tend to change the capacity and complexity of the manufactured mould, markets and client industries more often than Defenders. Prospectors will place a great emphasis on service, through product augmentation - a variety of services alongside mould development (this will involve product definition, product design, product definition-prototyping, the production of plastic pieces, assembling of plastic pieces, assembling of plastic pieces with other materials).

Prospectors are the creators of change and uncertainty by developing product and market innovation. As stated by Miles and Snow (1978:64) "Marketing and product development are regarded as most crucial". It will be expected that Prospectors will emphasise marketing policy. They will deal directly with their customers and will have branches and agents overseas. They will use advertising in specialise magazines, they will do workshops/seminars and conferences, they will participate in trade missions and international exhibitions fairs and they will send mailings to potential customers. Their investments will be concentrated on Research & Development, marketing, customer relationship development and training. They will fewest constraints on investment. As they are flexible firms they are often small firms. They will have qualified and younger employees and higher employee costs than Defenders. They will emphasise training policy.

Prospectors are pioneers in the use of new technology as well as in the use of multiple technologies. Consequently, it is expected that Prospectors will employ varied and sophisticated technologies such as wire cutting, quality control and injection. Prospectors continually modify their product-market domain in order to take advantage of perceived opportunities, therefore they emphasise flexible administrative systems. Consequently,

Prospectors will perceive decentralisation, information feedback, innovation, and simultaneous engineering processes as their main organisational management strengths.

Prospectors will offer innovation, something different and unique, a varied range of services and post sales support as a benefit to their customers. They will have recent customers as well as long-term customers. Prospectors will identify competition as being mainly abroad; they will identify Italy, France, Germany, America-Canada, and Far East as their competitors. They recognize that their competitors will score higher in technology expertise. They will tend to subcontract mainly complete or parts of the mould because it is profitable. They subcontract mainly to associate firms with whom they have a formal relationship. Concerning environmental trends, Prospectors will identify Eastern European countries as a threat and new markets as an opportunity. Analysers will occupy an intermediate position between Defenders and Prospectors. Reactors will have no distinctive competences and will not display a consistent pattern of strategic behaviour. Analysers will change as environmental conditions change. Accordingly to these principles the following hypothesis is developed:

> *H1.2. Different Miles and Snow's strategy types will reveal different business profiles that are consistent with the typology (i.e. firms that are categorised as one of these types will exhibit the patterns of behaviour expected from the literature).*

A set of propositions emerged:

- *Are there differences by strategy type in the size of moulds manufactured?*
- *Are there differences by strategy type in the complexity of manufactured moulds?*
- *Are there differences by strategy types in the geographical pattern of sales in 1996?*
- *Are there differences in the way that different strategy types have switched geographical markets (significant changes)?*
- *Are there differences in the client industries of different types of firm?*
- *Are there differences in service-product augmentation of different strategy types?*
- *Are there differences in the marketing policy of different strategy types?*
- *Are there differences in the investment policies of different strategy types?*
- *Are there differences in the technological profile of different strategy types?*

- Are there differences in the firm size, workforce and training policy of different strategy types?

- Are there differences in the management of different strategy types?

- Are there differences between strategy types in the benefits offered to customers?

- Are there differences in the competition of different strategy types?

- Are there differences in the subcontracting policy of different strategy types?

- Are there differences in the organisational environment of different strategy types?

The next section explores the relationships between Miles and Snow's strategy types and organisational performance.

4.2.2. Exploring the relationships between Miles and Snow's strategy types and organisational performance from a static viewpoint

As suggested by the literature, Defenders, Prospectors, and Analysers are equally likely to perform well and to outperform Reactors. This assumption was also tested by Smith Guthrie and Chen, (1989) therefore the following hypothesis has been developed:

H2. Defenders, Prospectors, and Analysers will perform equally well and will outperform Reactors.

According to the theory, it is expected that any of the three viable strategy types (Defenders, Prospectors and Analysers) are equally likely to perform well and to outperform Reactors. However, Hambrick (1983), Namiki (1989) and Zajac and Shortell (1989) contradicted this view and argued that the three strategy types do not perform equally well in given environments. Hambrick (1983) suggested that performance differences in the strategy types depend on the choice of performance measures employed and on the nature of business environment. These researchers corroborate the notion that certain behaviours are more suited to certain business environments, and as environments change, the "optimal" type also changes (certain environments favour certain strategies over others).

H2.1. Prospector and Analyser strategies outperform Defenders in changeable environments.

Miles and Snow (1978) suggested that Defenders see performance primarily in terms of efficiency (i.e. doing things right) while the Prospectors evaluate performance in terms of effectiveness (i.e. doing the right things in terms of product and market development). The performance literature reveals that Return on Assets (ROA) is a good performance measure to assess efficiency and Sales Growth Rate (SGR) is a good performance measure to assess the acceptance in the market place of new products or services. As a result, these measures will be used to assess performance in Defender and Prospector businesses. Therefore, the hypotheses below are tested:

H2.2. Defenders have a higher Return on Assets than Analysers, Prospectors and Reactors for the timescale analysed.

H2.3. Prospectors have a higher Sales Growth Rate than Analysers, Defenders and Reactors for the timescale analysed.

The theory also suggests that Defenders are low cost orientated, so it is expected that Defenders will have lower product costs related to technology and workforce, than Prospectors, consequently:

H2.4. Defenders are likely to have a lower product cost structure than Prospectors. Analysers will fall in between these two extremes.

This section developed the specific hypotheses to explore Miles and Snow's strategy types and the overall impact on organisational performance. The dynamics of strategy has been surprisingly neglected in the literature. The next section investigates the dynamics of Miles and Snow's strategy types.

4.2.3. Exploring the dynamics of Miles and Snow's strategy types

Most of researchers have empirically tested strategy types using cross-sectional studies. Cross-sectional studies are used on strategy types because they underline the notion that strategy types are equally viable across environmental contexts and consequently across time. Miles and Snow (1978) suggested that strategies persist over time, that Defenders, Analysers and Prospectors are equally viable across different environmental contexts and are, therefore, unlikely to change. Prospectors want to continue to prospect and Defenders to defend. However, questions about the validity of this assertion have been raised by Hambrick (1983) who argued that the success of strategy types varies across different industrial environments. Thus, if different strategies do not equally succeed across environmental contexts then as those contexts change, it must be expected that "optimal" strategies will change and that patterned changes in the external environment will lead to patterned changes in how firms move about in the four-fold categorisation of strategic behaviour. The assumption here is that some strategies are more successful than others depending on the nature of the environment. Yet Hambrick's cross-sectional study does not explore strategic changes over time in response to environmental changes. Therefore, there was a need to explore if, and how, firms change their strategies as the environment and other elements outlined in the conceptual framework change over time (there is a need to explore the notion of equally viable strategy types versus particular appropriate strategy/environmental conditions).

The notion of strategic choice recognises that similar organisations operating within the same environment may choose to address that environment differently based on the strategic orientation of their management (Ackoff, 1970). As stated by Miles and Snow (1978:47) "Defenders enact an environment of greater stability than do their counterparts within the same industry. Defenders deliberately create and maintain an environment for which a stable form of organisations is appropriate". The theory asserts that Prospectors fit better in a more dynamic environment. According to Miles and Snow (1978:65) "Prospectors enact an environment that is more dynamic than those of other types of organisations within the same industry".

Organisations may change from one strategy type to another because they perceive that their existing strategy type is less viable in a new environment. If the existing strategy type is seen to be viable in the current environment, it is not expected that the organisation will change its strategy. Conversely, if a strategy it is no longer suitable as a result of environmental change, it is likely that the organisation will change. Prior strategy dictates whether an organisation will change its strategy type to another. The likelihood of a firm changing strategy in response to a common environmental change differs according to the type of strategy that was being pursued before the environmental change took place.

With the exception of Zajac and Shortell (1989) and Smith and Grimm (1987), the dynamic process of changing from one strategy type to another as a result of environmental changes has been surprisingly neglected in the literature. Zajac and Shortell (1989) analysed strategy types, strategic changes over time, the likely direction of change in response to the changing environmental conditions and the performance implications of these dynamics. They concluded that organisations do change their strategies in response to particular environmental circumstances. Zajac and Shortell (1989) showed that hospitals, as the environment changed, shifted away from the Defender strategy to Analyser (primarily) and Prospector strategies. Smith and Grimm (1987) also showed that railroad firms changed their strategies in response to significant industry environmental changes (railroad deregulation). Shifting away from one strategy type to another, suggests that organisations do not all perceive generic strategies to be equally viable in new environments and across time - this seems to question one of Miles and Snow's core assumptions. Zajac and Shortell (1989) also showed that organisations which viewed themselves as Analysers were not likely to change their strategy after dramatic environmental changes. According to Miles and Snow Analysers are seen as the "balance strategy" and therefore are unlikely to change to another strategy type.

Thus, from previous researcher's finings we concluded that Defenders in new changeable environment are likely to change their strategy to Analysers or Prospectors. Analysers, as a "balanced strategy", are the strategy type to which firms will change most, as well as being

least likely to change to another strategy type. Reactors as suggested by Miles and Snow, are unlikely to change to another strategy type.

The international context of the Portuguese mould industry is important as 90% of its production is for exports. Thus, the development of this industry is largely dependent on the relative environmental conditions (e.g. economic, political, social) of the countries to which production is exported. During 1980-86 the Portuguese mould industry operated in a relative stable environment. The world economy favoured the Portuguese mould industry economic growth. However, from 1987 on onwards, the change of environmental factors such as macro-economic conditions, the appearance of new competitors or more demanding customers drove companies into different settings, which may force them to react by changing their strategy or just by further extending the current strategy. According to the literature, is expected that Defenders will be suitable for stable environments (i.e. 1980-86 periods) and that Analysers and Prospectors will have a better degree of fit in dynamic, turbulent environments (i.e. from 1987 onwards: 1987-1992, 1993-95, 1996 and 1997).

To reflect the approach used by Zajac and Shortel (1989) the following hypotheses were developed and explored within the Portuguese mould industry data:

H3. Firms change Miles and Snow's strategy types over the period 1980-1997. Firms change their strategy in response to environmental shifts.

H3.1. Defenders are most likely to change their strategy in response to significant environmental changes.

H3.2. Defenders are likely to change their strategy to Analysers or Prospectors.

H3.3. As Analysers are seen as a balanced strategy, firms who change their strategic behaviour are likely to change their strategy to the Analyser strategy type.

H3.4. Analysers are unlikely to change to another strategy type.

H3.5. Reactors are unlikely to change their strategy.

H3.6. Firms that change their strategy, i.e. the Movers, have different business profiles from firms that maintain their strategy types, i.e. the Stayers.

The research has developed hypotheses to explore the dynamics of strategy: whether firms change their strategy type over time, and their pattern of strategic change. Furthermore, the research has endeavoured to investigate if firms perform equally well across different environmental settings or if there are significant differences in performance in strategy types. It attempts to identify whether firms that have changed their strategy outperform those that have not and whether firms that have changed to one specific strategy type outperform those that have changed to other strategy type. The following section explores specific hypotheses for the analysis of the relationships between the dynamics of Miles and Snow's strategy types and organisational performance.

4.2.4. Exploring the relationships between the dynamics of Miles and Snow's strategy types and organisational performance

Zajac and Shortell (1989) analysed the relationships between the dynamics of strategy and business performance. They demonstrated that strategies were not equally viable across different environmental settings and that different strategy types did not perform equally well. Their findings suggested that organisations embedded in dynamic environments and employing the Defender strategy type were likely, on average, to be less profitable than those pursuing other strategy types. In more changeable environments, Prospectors and Analysers were found to outperform Defenders. Additionally, they found that different performance results were exhibited across strategy types, but that performance differences did not occur between firms that had changed their strategies compared to those that had not. There were also no significant performance differences between firms that had changed to one specific strategy type and those that had changed to other strategy type, i.e. firms that had changed to Analysers or Prospectors may or may not outperform those that had changed to Defenders.

Based on Zajac and Shortell's (1989) research it is expected that Defenders in dynamic environments will perform poorly relative to Analysers and Prospectors. There will not be

significant performance differences between those firms that have changed their strategy (i.e. the *movers),* and those that have not changed their strategy (i.e. the *stayers).* Additionally, there will not be significant performance differences between firms that have changed to one specific strategy type and those that have changed to other strategy type. Thus, the following hypotheses are developed:

H4. Overall, Movers do not outperform Stayers.

H4.1. Firms that changed to one specific strategy type may or may not outperform those that changed to another strategy type: firms that changed to Analysers may or may not outperform those firms that changed to Prospectors.

4.2.5. Testing the consistency of the Self-typing paragraph approach

The aim here was to discover whether the Portuguese mould makers' perception of their strategy was consistent to what the theory describes and the researcher's knowledge (perception) of what firms' strategic behaviour actually was. The researcher's knowledge (perception) in this instance was based on the information gathered in the interviews with managers and "unsaid information" derived from visits to the plants, observation of the surrounding environment and secondary data. According to what other researchers discovered (Shortell and Zajac, 1990; James and Hatten, 1995), the Self-Typing paragraph approach is seen to be an effective measure for determining what the strategy of businesses actually is. Therefore, the following hypothesis is developed:

H5. The self-typing paragraph approach is an effective means of identifying strategic types.

4.3. Conclusions from the conceptual framework and the research hypotheses

The current chapter has developed a conceptual framework that attempts to integrate many elements drawn from a wide body of literature in order to measure and explain the inter-relationships between business strategy, the dynamics of strategy and organisational

performance in the Portuguese mould industry using the Miles and Snow's typology as a means of categorising several complex and multi-dimensional aspects of business strategy and strategic behaviour.

Business strategy development in the Portuguese mould industry is analysed through the internal arrangements of the organisation; by examining how firms choose their organisation domain (product and/or services, markets and industry clients); by analysing firms' marketing policy; by analysing how firms invest (R&D, technology infrastructures, customer-marketing-trading, customer relationships); by looking at firms technological profile; by analysing organisational size, workforce development and training; and by analysing organisational management capability. The way that firms deal with their customers, analyse their competitors, position themselves in the value and supply chains and how firms internalise and react to environmental trends are all dimensions on which, firms will be compared, and these dimensions are built into the conceptual framework. In addition, a complex approach to analysing organisational performance is embedded into the model. The conceptual framework has been presented in both static and dynamic mode. In static mode, the data will be analysed cross-sectionally, and in dynamic mode, the data will be analysed longitudinally. The prime aim of the thesis is to test an array of hypotheses that emerged from a review of the literature on strategic behaviour and strategic typologies using the work of Miles and Snow as a reference set.

From the conceptual framework specific hypotheses have been developed to explore the applicability of Miles and Snow's strategic typology, to explore the dynamics of strategy and to look at the relationship between strategic behaviour and organisational performance in the Portuguese manufacturing sector (for a further discussion see appendix 3). The conceptual framework was used to structure the empirical phase of the research and as a basis for research design. The framework identifies the elements about which data needed to be collected to make the research operational. The structure of the conceptual framework defined the structure of the questionnaire and the entire evidence collection process. The following chapter discusses the methodological issues that the operationalisation of the

conceptual framework and its attendant hypotheses and research questions raised. The next chapter outlines the research philosophy and the operational research design. It also explains the different methods of data collection employed that would collect the evidence that would populate the conceptual model with data for robust analysis.

CHAPTER 5

Research Methodology

5.0. Introduction

The aim of this chapter is to describe the research methodology used - i.e. the research philosophy, the research strategy and purpose and the research design including the methods and techniques used in the data collection process. The chapter is divided in three parts. The first outlines the research philosophy. A distinction will be made between the positivistic and the phenomenological approach and it is shown how the current study sits within this. The second part comprises the research strategy and purpose. A brief discussion will be presented of the different research strategies and different research purposes of the current study. These will be outlined to explain the methods used and how these helped to test the hypotheses and achieve the research aims. The selection of the research strategy and purpose of each stage of the current study is justified. Finally, a flow chart is drawn to illustrate the chronological and methodological processes followed. The third part illustrates the research design – the data collection method and techniques. This is divided into two stages. The first will describe the critical literature review, the secondary data collection, and the qualitative exploratory data collection, in the form of in-depth interviews and semi-structured interviews. The second stage will feature the survey strategy, which is descriptive and explanatory in nature, and involves quantitative data collection in the form of questionnaires. Each of the data collection methods will be described emphasising strengths and weaknesses, and how the hybrid strategy has led to a rigorous methodology. The method of analysis, reliability and validity are also discussed.

5.1. Research Philosophy

This research aimed to understand business strategy, the dynamics of strategy, the strategic change in response to environmental changes and their overall implications

on business performance within the Portuguese mould manufacturing sector. The research aim suggests the need for adopting different philosophical methodological approaches.

Philosophical issues help researchers to clarify the research design and the configuration of the research. According to Easterby-Smith et al. (1996) the selection of the approach used to conduct research is very important. First, it enables the researcher to take a deeper understanding of the research design, i.e. the selection of methods by which data are collected and analysed; the evidence that is needed to be gathered; and from where, whom, and how that evidence needs to be arrayed in order to provide satisfactory answers to the hypotheses. Second, it helps researchers to understand which approach will be more suitable for their particular needs. Third, an understanding of the different approaches allows the researcher to develop a research design that overcomes or reduces its limitations. If researchers have a clear understanding of research design they will be able to develop each phase of the research process correctly. There are two main philosophical schools of thoughts; positivism and phenomenology. Both perspectives are outlined and discussed below in relation to the current study.

5.1.1. The Phenomenological approach

The phenomenological approach is concerned with the meaning that research subjects attach to social phenomena. It is based on the way that people experience social phenomena according to the world in which they live. The phenomenological researcher seeks to understand how and why the phenomenon is happening, and therefore he/she investigates the context in which the events are taking place. For example, data would be collected through interviews, individually or in a group, without any clear theoretical position in mind. The task would be to make sense of the data that has been collected through its analysis. The analysis of the output would form the theory. Data is collected and then theory developed. Theory would follow data. Theory in this case is formed in an *inductive* way. For the phenomenological approach, a study of a small sample of subjects is appropriate largely. Researchers are more

likely to work with qualitative data and use a variety of methods to collect these data in order to establish different views of the phenomena (Easterby-Smith et al., 1996).

In order to investigate "How do the Portuguese mould manufacturing firms craft their strategies?" the current research used the phenomenological approach in its first methodological stage. In-depth interviews and semi-structured interviews with the Portuguese mould industry's top managers were conducted. This interpretative approach seemed more appropriate at this stage as the objective was to capture and record the Portuguese mould manager's experience, beliefs and views about business strategy. The aim was to understand the meaning of strategy and to identify the key strategic factors for the Portuguese mould managers. It was also an objective to comprehend how the concept of strategy has evolved over the years as the environment undergoes continuous and discontinuous changes.

Contrary to the phenomenological approach, the positivistic viewpoint assumes that the individual should be free of subjectivity, exempt of feelings, sentiments, or intuition. In this perspective, the social world is approached by the natural scientist as an experiment, and therefore should be measured through objective methods (Easterby-Smith et al., 1996). In the positivist approach, we have theory and we test it. It is clear what the questions are and how the testing is going to be carried out. A study of a large sample of subjects is acquired, and generally, researchers are more likely to work with quantitative data. The Positivist approach is discussed below.

5.1.2. The Positivism approach

The positivist approach relies on *scientific* methods to conduct research (Robson, 1995). Science follows a process of hypothesising essential laws and then deduces through observation which of those laws will demonstrate the truth or falseness of hypotheses. It deducts the hypotheses, defines the terms of its operationalisation, tests it, analyses the results and, accordingly, the theory is or not changed. The positivistic approach emphasises interdependence and the value-freedom of the observer. It highlights causality, reductionism and generalisation. A common social science

research objective is to identify causal explanations and generate principles that explain consistency in human behaviour: it role is often to generalise about human behaviour. The better way to deal and understand problems is to reduce them to the simplest possible elements consistency (see Easterby-Smith et al., 1996).

In order to describe, generalise and explain casual relationships of the Portuguese mould firm's strategic behaviour, the current research in its second methodological stage has followed the positivist approach. After a critical analysis of the literature, and based on theory, hypotheses have been deduced to describe business strategy in Portuguese mould making firms and to test casual relationships between business strategy and performance. The hypotheses explored business strategy, the evolution of business strategy over the years, the impact of environmental factors on strategic change and the overall implications on performance. Business strategy was carefully defined and strategy responses were standardised. Through a survey questionnaire the hypotheses were investigated. A strongly structured methodology was employed in order to facilitate data comparison and to simplify replication (Gill and Johnson, 1991). The empirical study was applied to a large sample in which evidence of strategic behaviour was found. Data were analysed and the results produced to confirm or reject the theory.

The research combines both perspectives. However it is closer to a positivist philosophy than a phenomenological one (see Figure 23). The current study is scientific in its approach, although it should not be considered wholly positivistic as it acknowledges the subjective element of human nature and recognises that the strategic key elements identified were a function of the manager's own experiences and were influenced by their social interactions with their environment. The next section discusses the use of both approaches in the research design.

Figure 23 - The current study position in the research philosophy

5.1.3. Combining approaches to research

Each approach has yielded a valuable contribution for the research design of this study. Both perspectives are different in essence but when combined their respective advantages can be reinforced and their limitations confined. As suggested by Saunders et al., (2000) the phenomenological approach facilitates the understanding of how and why, it enables the researcher to be involved and register the changes that occur during the research process and permits a good comprehension of the social process. However, the phenomenological approach has disadvantages: the data collection can be time consuming; data analysis could be difficult; clear patterns may not emerge from the data; and is frequently perceived as less credible by "non-researchers". Conversely, the positivist approach allows an economical collection of a large amount of data; enables easy data comparison; and the researcher has a clear theoretical focus as well as greater control over the research process. However, the positivist approach is inflexible, once the data collection has started, the research direction cannot be changed; it does not take into account the social process or the meaning that people attach to the social phenomena. The following section summarises the current research philosophy.

5.1.4. Summary of the research philosophy

This section has examined two different philosophical approaches, i.e. phenomenology and positivism. The phenomenological point of view investigates the individual's interpretations of the social world, their beliefs, and their experiences in their own and unique environment. The positivist approach sees the social world in a scientific way, producing the same results for everyone. These two perspectives are not mutually exclusive; they can be used in combination on the same research project depending on the aim of each different stage of the research. The research used both perspectives, although it is closer to the positivist philosophy than to the phenomenology. In its first stage, and in order to understand strategy within the Portuguese mould industry, the

interpretative approach was applied. The aim was to investigate how strategy was crafted, and why. In its second stage, in order to generalise the Portuguese mould firm's strategic behaviour and to establish a causal relationship between business strategy and organisational performance, the positivist point of view was adopted. The use of both approaches in the current research enabled the minimisation of their individual disadvantages and the maximisation of their advantages.

Based on the selected research philosophy, the next phase of the research methodology describes the research strategy that allows the hypotheses to be tested and the research objectives to be met. The following section explores and evaluates the research strategy selected for the current study.

5.2. Research strategy and research purpose

According to Robson (1995), there are three traditional research strategies: experiment, survey and case study. Saunders, et al., (2000) also recognise two other ways to engage research, i.e. cross-sectional and longitudinal studies. Experiment, as Robson (1995:40) defines, is much like the natural science research, i.e. "measures the effect of manipulating one variable on another variable". It involves the selection of a sample from a known population; the submission of samples to different experimental conditions; the introduction of planned change on one or more variables; the measurement of a small number of variables; and the control of other variables. It normally involves hypotheses testing. It answers "how" and "why" (Robson, 1995:43). Survey strategy comprises the collection of data in a standardised manner from a group of people, generally in a format of a questionnaire. It involves the selection of samples of individuals from known populations, and the collection of data in a standardised form from each individual. It answers "who", "what", "where", "how many" and "how much", (Robson, 1995:43). A case study, as defined by Robson (1995:40), is the "development of detailed, intensive knowledge about a single "case", or a small number of related "cases". It achieves a deeper understanding of the context of the research and the process being enacted (Morris and Wood, 1991). Case study is a

broad and intensive way of exploring existing theory. This approach is relevant in answering “How” and “why” (Robson, 1995:44).

The cross-sectional study analyses the phenomena at a specific given point in time, as a “snapshot” taken at a particular moment. Cross-sectional studies frequently use a survey strategy (Robson, 1995; Easterby-Smith et al., 1996). Longitudinal studies examine the phenomena over a given period of time. It is particularly relevant to assess change and development. Its major strength is the valuable and powerful insight that can be derived from the evaluation of change (Dixon et al.1987).

Research can be defined in terms of its research purpose as well as its strategy, (Bryman, 1988; Robson, 1995). There are three research purposes, i.e. exploratory, descriptive and explanatory. Exploratory studies are a valuable way to explore events; to ascertain “what is happening; to seek new insights; to ask questions and to assess phenomena in a new light” (Robson, 1995:42). Emory and Cooper (1996) suggest three ways of conducting exploratory research: a) a search of literature; b) talking to experts in the subject; and c) conducting focus group interviews. The major advantage of the exploratory research is its flexibility and adaptability to change. Flexibility is not synonymous with absence of direction in the research, but means that the research focus initially is broad and is narrowed progressively as the research proceeds (Adams and Schvaneveldt, 1991). Descriptive studies aim to describe in detail a situation or a set of events. It is required to have a clear idea and great knowledge of the phenomena, before undertaking the data collection. Descriptive research is a means to the end rather than an end in itself. Explanatory studies look for an explanation of the phenomena, normally by testing causal relationships between variables. It attempts to investigate the situation or a problem in order to explain the relationship between two or more variables, i.e. “why” the phenomenon has happened.

Robson (1995) suggests that surveys have been appropriated for descriptive studies, experiments for explanatory studies and case studies for exploratory work. However, Robson (1995:43) also defends that “each strategy can be used for any or all three purposes”. Consequently, more than one strategy can be used for the research project,

as it can be used more than one research purpose, it depends on the research objectives and the hypotheses of each stage of the research project. The strategy and the purpose of the research may change over the period.

As shown in Chapter 2, research on business strategy and organisational performance relationships within the Portuguese mould industry is almost non-existent. The main literature on business strategy is American. Therefore, to be able to investigate "how do firms craft their strategy", the research in its first stage has had an exploratory purpose. The aim was to investigate what was happening specifically within the Portuguese mould industry, and to gain a deeper understanding of the context. It was necessary to understand what strategy meant for the Portuguese mould managers, to identify key strategic factors that describe strategy for them, and comprehend how they have developed strategy over the years under the influence of environmental factors. The exploratory research made use of qualitative data, through in-depth interviews and semi-structured interviews with the Portuguese mould managers.

The next stage of the research has followed a more descriptive and explanatory purpose. After understand the meaning of strategy, the aim was to explore the generalisability and validity of the literature within the context of Portuguese moulding firms. Descriptive studies enable a detailed description to be made of what has happened in the industry. The research was also interested in explaining the relationship between business strategy and organisational performance, and investigating "why" to the hypotheses: - "Different patterns of strategies are not associated with different levels of organisational performance". The descriptive and exploratory purpose made use of a survey strategy in the form of a questionnaire. The survey strategy enables a large amount of information to be gathered from a large population, allowing easy data comparison and replication. It is easily understood and the researcher has more control over the research process.

Another objective of the research was to assess strategy evolution and change. In order to explore whether: "Firms have changed their strategy over the period 1980-97", the research made use of a longitudinal study.

As can be seen, the research has used multiple different methods and approaches to explore different hypotheses and different research objectives. In its first stage, its purpose was exploratory and the research made use of interviews. In its second stage, the research purpose was descriptive and explanatory and it made use of a survey strategy in the form of a questionnaire. As suggested by Homans (1961:330),

> "…methodology (…) is a matter of strategy, not of morals. There are neither good nor bad methods but only methods that are more or less effective under particular circumstances."

A hybrid strategy as defined by Robson, (1995), and Saunders, et al., (2000), is a combination of more than one strategy and more than one data collection method. Robson (1995:290) suggested that "the only feasible strategy is to use a variety of methods". The current study has used a hybrid strategy, which has allowed a comprehensive and holistic point of view of business strategy. The next section explains the advantages of using a hybrid strategy in the current research design.

5.2.1. Multiple method, multiple approaches: a hybrid strategy

There are two major advantages of using multi-methods and multi approaches to conduct research. First, the use of different methods increases confidence in the results. Each single method or technique has its unique strengths and weaknesses (Smith, 1975). There is a relationship between the data collection method that has been used and the results obtained, i.e. the results will be affected by the method used. Different methods have different effects and the use of different methods eliminates the "method effect" and increases confidence in the conclusions obtained. As Robson (1995:290) suggested, one of the most important benefits of using multiple methods is the "reduction of inappropriate certainty". Using several methods may drive the researcher to different answers shifting way from the straight certainty offered by the use of one single method. The use of different data collection methods ensures clarity of information. The employment of methods that are very different from each other enable researchers to move towards "the" best answer (Robson, 1995:290). They

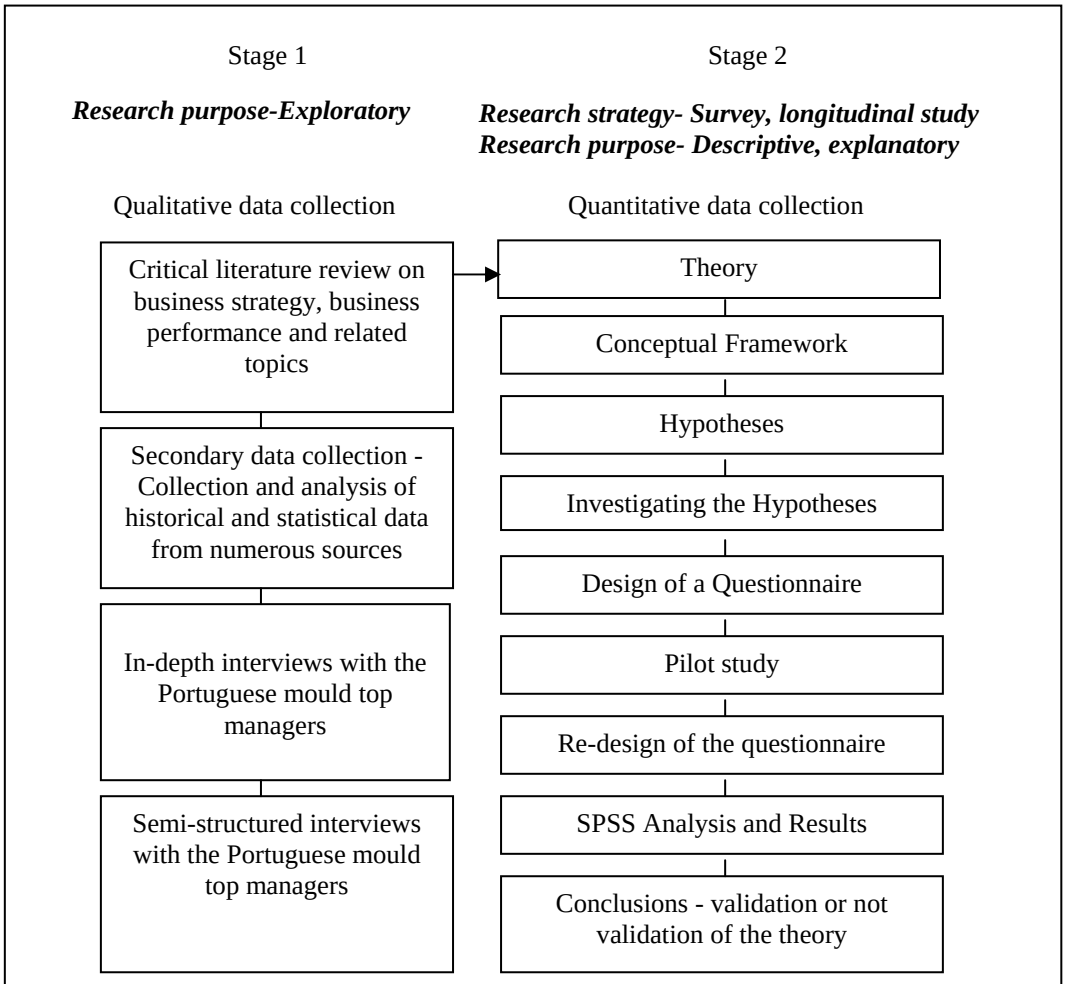
ensure that the *method error* is diluted. Different methods may endorse complementary questions in the study; "complementary purposes", allowing the possibility to "enhance interpretability", and "assess the plausibility of threats to validity" Robson, (1995: 291). In the current study the use of interviews in its first stage, enabled the development of a comprehensive understanding of the Portuguese mould manager's key issues before proceeding with the survey instrument. This imbued the research data with confidence, and ensured that the most important issues have been addressed.

The second advantage of combining multi-methods and approaches is the capacity to triangulate information (Robson, 1995). According to Saunders, et al., (1997:80) "Triangulation refers to the use of different data collection methods within one study in order to ensure that the data are telling you what you think they are telling you". As suggested by Denzin (1989) there are four different ways to undertake triangulation: a) data source triangulation, b) investigator triangulation; c) theory triangulation, and d) methodological triangulation. The research, in order to gain a deeper understanding and a holistic view of the meaning of strategy for the Portuguese mould managers, used different data sources and data collection methods. It has collected both primary and secondary data (i.e. data source triangulation) and used both qualitative and quantitative data collection methods (i.e. methodological triangulation).
The hybrid strategy used in the current study allowed the strengths of both survey and longitudinal research strategies to obtained and enforced the advantages of the different research purposes, i.e. the exploratory, descriptive and explanatory. The use of hybrid strategy allows the researcher to reach a deeper understanding of the overall setting (Morse, 1994).

In order to provide an overview and to simplify the research strategy followed in the current study, a framework was developed (see Figure 24 - a hybrid strategy). As described previously, the research strategy in its primary data collection has comprised two distinctive stages. The first stage had an exploratory purpose, which involved a critical analysis of the literature and the collection of qualitative data through in-depth interviews and semi-structured interviews. This stage created the grounds for the development of a model and the deduction of the hypotheses. The second stage

comprised both descriptive and explanatory purposes, involving a survey strategy and a longitudinal study. It made use of quantitative data collection. In this second stage hypotheses were tested through administration of a questionnaire, and based on the analysis of the results the model was revised. The research has also collected secondary data, through the analysis of historical and statistical data. The subsequent section synthesises the research strategy and the research purpose of the current study.

Figure 24 - A hybrid research strategy



5.2.2. Summary of the research strategy and the research purpose.

In summary, this section has discussed the research strategy and research purpose of the current study. A hybrid research strategy was selected to conduct the research design, as different research strategies and data collection methods were applied for the different research objectives and hypotheses in different stages of the research project. Very little literature on business strategy and organisational performance exists within the Portuguese mould industry. Therefore, the primary data collection of the first stage of the research has undertaken an exploratory purpose. The aim was to develop a deeper understanding of the meaning of strategy for the Portuguese mould managers and their context. Through a critical analysis of the literature, in-depth interviews and semi-structured interviews with the Portuguese mould top managers, key strategic factors were identified and a model built in order to describe strategy development. In the second stage of the primary data collection, the aim was to generalise, validate and explain the Portuguese mould manager's strategic behaviour and how they have changed their business strategy over the years under the influence of environmental factors. In order to accomplish this, the current study made use of a survey research strategy and a longitudinal study based on descriptive and explanatory research purpose. Hypotheses were deduced and tested through administration of a questionnaire. The current study has also collected secondary data by the analysis of historical and statistical information. Using a hybrid research strategy the current study attempted to reflect a holistic point of view of strategy within the studied industry.

As briefly described above, the research has used a variety of data collection methods. It starts with the search of the literature review; made use of exploratory interviews, i.e. in-depth and semi-structured interviews, collected secondary data and, based on theory and on the previous data collected, a questionnaire was designed, tested, re-

designed and administered. The next section describes and discusses the different types of data collection methods and techniques.

5.3. Research methodology - Data Collection methods and techniques

5.3.1. Critical literature review

An important part of the current study comprised a critical literature review. This enabled the research to be focused (Robson, 1995) as well as the research problem to be conceptualised (Marshall and Rossman, 1995). The current study examined literature on business strategy, e.g. innovation technology, market-product domain, people- knowledge, organisational knowledge, customers, suppliers, competitors and environmental trends; strategic typologies; strategic changes-dynamics of strategy and organisational performance. The reviewed literature allowed the identification of areas of established research as well as a research gap. The literature surveyed provided a focus and guidance for the current study, showing that there was a need to investigate business strategy and organisational performance relationships within the Portuguese mould firms' context. As business strategy has been of great interest, i.e. extensively researched especially in America, the information required was available and it was relatively accessible. The sources of the literature were libraries, databases, well-known journals and magazines, CD ROMs, and from the Internet, both in the UK and in Portugal. The next section reviews the other methods of data collection, used in the current study i.e. the interviews.

5.3.2. Exploratory interviews

As Robson (1995:228) stated, an "interview is a kind of conversation; a conversation with a purpose". It is a conversation that is "initiated by the interviewer for the specific purpose of obtaining research-relevant information and focused by him on content specified by research objectives of systematic description, prediction or explanation" (Cohen and Manion, 1989:307). Interviews are based on meanings revealed through words, allowing a deeper and rich understanding of the phenomena and its context.

They are a flexible and adaptable way of exploring issues (Robson, 1995). Interviews can be longer than mailed surveys, as the interviewees will be encouraged to talk. However, some lack of standardisation may imply some difficulties in bias control as well as reliability. Interviews are also time-consuming.

In order to test the hypotheses and understand how the Portuguese mould firms craft their strategies, how strategy has evolved, i.e. the dynamics of strategy, and the influence of environmental factors on strategic change, the current study in its first stage of primary data collection has conducted in-depth interviews and semi-structured interviews with the Portuguese mould top managers. The aim of these interviews was to gain a deeper and wider understanding of the literature by investigating business strategy within the Portuguese mould firms' context. Both types of interviews are described and discussed in the following section. Their advantages and disadvantages are discussed; why that particular method was selected; when, who, and why they have been interviewed; the sampling selection and how access to the organisations has been gained; how the interviews have been conducted, what has been asked, how long the interviews lasted; how the information has been recorded and analysed, and finally the validity and reliability of the method.

5.3.2.1. In-depth interviews with the Portuguese mould top managers

The advantages and disadvantages of in-depth interviews

In-depth (Alston and Bowles, 1998) also referred to as unstructured (Robson, 1995), or even, informal interviews (Bryman, 1995, Burgess, 1997) are interviews where the interviewer has a general idea of interest but gives the freedom to the interviewee to develop the conversation within the area. Often seen as being a discussion, they are ideally guided by the respondent rather than the interviewer (Alston and Bowles, 1998). The structure of in-depth interviews depends on the nature of the subject, the context of the interview and the inner characteristics of both researcher and participant, although they may begin with no structure at all other than a general topic. The researchers start with a number of areas or topics, which they wish to cover, but if

new issues emerge they can be fully explored. The objective of an in-depth interview is to view the world as the interviewee is seeing it, to investigate their beliefs and comprehend their thoughts (Alston and Bowles, 1998). Face-to-face interviews enable researchers to follow the participant's responses and to investigate underlying reasons as well as clarifying misunderstandings. The participants can be asked to explain and specify the meaning of their responses (Alston and Bowles, 1998). The key element of an in-depth interview is the capacity to establish a relationship between the interviewee and the interviewer in a way that the interviewee feels free to openly express his ideas, experiences and feelings. The development of an empathy where the respondent feels understood, that notice is being taken of his points, and that approval is being given is crucial in the in-depth interviewing. Reinharz (1992:26) suggested that "every aspect of the researcher's identity can impede or enhance empathy". Empathy is based on the inner characteristics of the interviewer, e.g. communication skills, age, gender, socio-economic status, and so on.

Interviews are the most flexible type of research instrument used in qualitative research. They enable a rich understanding of the phenomena and its context. However, they can be time consuming, and the vast amount of data collected may be difficult to analyse and compare. Interviews allow the research to capture non-verbal behaviour during the interview, allow the researcher to have a great control over the questioning order, and permit more complex questions to be asked as the participant can take his time in answering (Sarantakos, 1993). After the advantages and disadvantages of the in-depth interviews have been described, the next section outlines the reasons for the choice of this method.

Why the current research has used in-depth interviews

The almost non-existent literature on business strategy and organisational performance within the Portuguese mould industry impelled the researcher towards the use of in-depth interviews. In the current study it was required to comprehend the richness of strategy concept for this industry, as well as to identify the key strategic elements that could describe its meaning. It was also important to understand the firms' strategic

development over the years. The data derived from the in-depth interviews, based on the experience and beliefs of the moulding managers enhanced the described objective. These interviews have provided an in-depth understanding of the managers' strategic behaviour and the reasons behind the business strategic change. The reasons for the choice of this method having been established, the next section discusses the targeted group for the in-depth interviews.

The selection of interviewees: in-depth interviews

In April 1996, six top managers were in-depth interviewed at their firms. These managers were selected for the interviews because they have a rich knowledge and understanding of the industry and its evolution. Due to their position and experience, they hold valuable information and are able to provide on overview of the industry. Two of these managers have been in the industry for more than 50 years, and they have been recognised by the Portuguese mould association as well as by other managers as being very knowledgeable people in the industry, i.e. experts. Their names are associated with the beginning of the industry in Portugal. Marshall and Rossman (1995:83) designated this category of managers as elite individuals. As they suggest "elite individuals are those considered to be the influential, the prominent, and the well informed people in an organisation or community who are selected for interviews on the basis of their expertise in the areas relevant to the research".

The aim of these interviews was to gain a deeper insight into the understanding of strategy development, through the manager's own experiences and beliefs. These managers occupy different positions in the industry, which has allowed the researcher to capture different points of view from different angles of the industry. A variety of different views and opinions enriched the data. One of the managers has his own small mould manufacturing firm; two are related to the industry as suppliers (one is an injection component supplier, and the other an engineering consultant); one owns a number of mould manufacturing firms as well as a trading moulding company; one is a customer of the industry, who owns a trading moulding firm, i.e. is an intermediary between the mould makers and the overseas customers; and one is a manager of the

mould industry desk of a governmental institution (equivalent to DTI). These managers have many years of experience and they are believed to have a good deal of commonality in the meaning attached to strategy development. The elite individuals interviewed allowed a broad view of strategy development in this industry, which enabled comparison with the responses of the other managers. For reasons of confidentiality the identity of the participants is to be kept anonymous. The next section explains how the group was selected and the access to them.

Sampling selected and access to the organisation

A non-probability sampling technique in a form of purposive-homogeneous sampling was used to identify participants. This sampling technique enabled researchers to collect data in great depth (Saunders et al., 2000).

In order to gain access to the top managers, the researcher made several phone calls until she was able to reach them. On the phone the researcher presented herself, explained the nature of the research and the objective of the interviews. Confidentiality of the information given was assured. Consent was then given by the top managers to conduct the interviews and an appointment was arranged. Timing and location for the interviews was agreed. Each of the interviews took place in the respective manager's organisations. All the managers contacted demonstrated rapport and willingness to participate in the research project. The subsequent section illustrates how the in-depth interviews have been developed.

How the in-depth interviews have been conducted, what has been asked, how long the interviews lasted

The interviews covered a range of topics. Very general questions were asked about the business strategy development, the organisation's product-market domain, the organisation's customers, and competition; the organisation's strengths and weaknesses; the organisation's opportunities and threats; the business strategy development over the period, i.e. the dynamics of strategy; the changes in the environment; and the impact of those environmental changes on the organisation's

business strategy. The questions were used as a guideline and were used with flexibility within each interview, allowing for the development of new emergent issues. Probing questions were used during the conversation. A copy of the interview's questions can be seen in appendix 4A. The interviews lasted from one and a half hours up to two hours. The ensuing section discusses the process of data analysis.

How the information has been recorded and analysed

Extensive hand notes were taken during each of the interviews with the permission of the participant. The conversation flowed with amity. Notes on the body language during the interviews were also recorded. The notes were re-read as soon as possible after the completion of the in-depth interviews, to ensure accuracy.
Content analysis was used in the assessment of the recorded information, i.e. to identify, code and categorise the data (Patton, 1990). It allowed the reduction of the information and the identification of salient issues towards answering the hypotheses. Alston and Bowles (1998:178) defined content analysis as "the analysis of some form of communication for trends or patterns". As suggested by Sarantakos (1993) content analysis identifies and evaluates information that appears to be theoretically relevant and meaningful, and which is related to the main queries of the research project. Content analysis codifies common sense to describe and explain aspects of the words (Robson, 1995). One of the advantages of using content analysis is that the data are constantly being developed and therefore can be subject to re-evaluation, enabling reliability checks and replication studies (Robson, 1995). It is also valuable in evaluating not only the information gathered but also the excluded data, e.g. in the case of the interviews what was not said (Alston and Bowles, 1998). In the current study, content analysis permitted a systematic breakdown and separation of all data recorded in the interviews into relevant categories.

The data collected in the in-depth interviews has followed three distinctive stages, as suggested by Wolcott (1994): i) description, ii) analysis and iii) interpretation. The information was re-read and examined in order to identify key words that described business strategy, and which were systematically mentioned by the top managers. The

information was then coded using the key words utilised by the interviewees e.g., technology (TEC), customers (CUS), competitors (COM), etc. Topics were developed from the coding and patterns were colour distinguished. Each single category of subject or topic was underlined with the same colour, which helped to highlight the frequency of the discussed topics in the interviews. The analysis of the data enabled the data to be integrated and classified into categories of topics or subjects, showing its diversity as well as its trends. This process provides an intelligible and comprehensive analysis of the key elements of business strategy for the moulding managers. The following section describes and assesses the reliability and validity of the method.

The Reliability and Validity of in-depth interviews

To ensure the credibility of the research findings, the researcher should reduce the possibility of getting the answer wrong. As Rogers (1961) said (see Raimond, 1993:55)

> " scientific methodology needs to be seen for what it truly is, a way of preventing me from deceiving myself in regard to my creatively formed subjective hunches which have developed out of the relationship between me and my material".

In order to achieve credibility of the research findings the research design should ensure its reliability and validity. Reliability and validity concern how concrete measures, or indicators are developed for constructs. As suggested by Newman (1997:138), reliability "tells us about an indicator's dependability and consistency". A reliable indicator or measure provides the same result each time the subject is measured. It means that the information given by indicators does not vary because of characteristics of the indicator, instrument or measurement. Validity "tells us whether an indicator actually captures the meaning of the construct in which we are interested" (Newman 1997:138). Validity assesses whether the data is really telling us what we understand it to be saying.

The reliability of in-depth or unstructured interviews is frequently questioned in the methodological literature. As mentioned before, unstructured or in-depth interviews

allow for a deeper understanding of the phenomena and its context. However, the flexibility and adaptability of the interviews as well as considerable amount of in-depth information collected may confine data analysis and the comparability of the results, questioning the reliability of the results. As suggested by Silverman, (1993:148) "it is important that each respondent understands the question in the same way and that answers can be coded without the possibility of uncertainty." In an attempt to increase the reliability of the interviews, the research has standardised the questions to some extent, and made use of prompts (see appendix 4A). The standardisation of the questions increases the reliability without threatening the interview's flexibility.

Robson (1995) states that there may be four threats to reliability, i.e. subject error, and subject bias, observer error and observer bias. In the current research, to overcome the *subject error*, all the interviews were conducted at a place and time convenient for the Portuguese mould managers. Most of the interviews took place at 8.00 a.m. i.e. just at the beginning of the day, before they start work; or 12.00 p.m. i.e. at the end of the morning, just before lunch time; or 6.00 p.m. about to finish the workday, when all the employees have gone and the phones have stopped ringing. If the interviews were conducted during work time, the interviews may be constantly interrupted by customers or employees, or by phone calls, taking away the concentration of the manager from the interviews or even changing his mood, e.g. his freedom or willingness to continue the interview as something urgent may have happened requiring immediate action. To overcome the *subject bias* threat to reliability, the researcher in the current study made use of probes during the interviews. In an attempt to eliminate any misunderstanding, the participant was asked to go over the subject again and to explain and specify the meaning of his responses. The observer error was constrained in the current research by the employment of a high degree of structure in the interview schedule in order to ensure that the same questions in other interviews were asked, which therefore ensured the reliability of the results. *The Observer bias* was eliminated in the current study, as the researcher was the only one conducting the interviews, and therefore there was only one way to interpret the results.

As mentioned previously, validity assesses whether the findings are really about what they appear to be about, if they measure what it is thought, they measure, Robson (1995). Campbell and Stanley (1963) have suggested eight possible threats to internal validity, to which Cook and Campbell (1979) added four more. They are history, testing, instrumentation, regression, mortality, maturation, selection, selection by maturation interaction, ambiguity about causal direction, diffusion of treatments, compensatory equalization of treatments, and compensatory rivalry. None of these threats has affected the internal validity of the current study.

To ensure the validity of individual questions in the interview scheme, the questions were pre-tested on two top managers within the mould industry; one is a top manufacturing manager, and the other is a consultant in the industry. The pre-testing aimed to ensure that the questions were understandable and suitable for the respondents, and that they provide the information required in order to be able to test the hypotheses and the research objectives. The managers were asked whether the questions had meaning; whether they understood the language easily, i.e. clear communication; whether the questions were correctly developed in order to measure their opinions and attitudes, i.e. their behaviour, and whether the questions motivated them to be involved in the interviews (Denzin, 1989). To increase reliability of the results, objectivity and neutrality was kept by the interviewer during the in-depth interviews.

External validity, also called generalisability (Robson, 1995), is concerned with the extent to which the research results are generalisable, i.e. may the research findings be equally applicable to other research settings or populations? However, how do we know that the case studied is representative of all cases? Bryman (1988) proposed three possible ways to overcome this problem: a) the researcher should study more than one case, enabling comparability of the results; b) the cases selected should be "typical" and should comprise certain features; c) more than one researcher should conduct the research as well as analyse the data. The current study has followed Bryman's steps to increase the research validity. The number of interviews undertaken allowed the researcher to capture similarities among the top managers as well as to

enable data comparison. The managers selected for the in-depth interviews shared certain characteristics, due to their position in the industry; they had a clear and comprehensive view of business strategy development and its evolution. However, due to the nature of this research, i.e. doctoral programme, the use of more than one researcher to conduct the research study was inappropriate. The objective of the interviews with the top managers was to gain a deeper insight into business strategy within the Portuguese mould industry and to ensure that the key strategic elements identified were representative of the entire population.

In order to trial the results of the in-depth or unstructured interviews, semi-structured interviews with the Portuguese top moulding mangers were conducted. The semi-structured interviews are discussed below.

5.3.2.2. Semi-structured interviews with the Portuguese mould top managers

The advantages and disadvantages of semi-structured interviews

Semi-structured interviews fall somewhere between in-depth interviews and structured interviews (Alston and Bowles, 1998). They are based upon a well-defined set of questions or pre-prepared topics, although the researcher still has the freedom to select the range of topics, to sequence the questions, to choose the wording used and the amount of time and attention given to different themes (Robson, 1995). Semi-structured interviews enable researchers to explore additional information that the participant raises; to ask questions other than the structured ones, or just to discuss new issues that were not originally included in the interview's schedule. The interviewer has the capacity to change the order of the questions according to what he/she thinks is more convenient or appropriate as the interview develops. Semi-structured interviews are instruments of exploratory and descriptive research designs in which the researcher is investigating topics, of which he/she has little prior knowledge of the participant's thoughts (Alston and Bowles, 1998). Researchers conducting semi-structured interviews need to be skilful, because the interview depends on the researcher's ability to select, investigate and correctly record additional

information. Generally, semi-structured interview schedules contain many open-ended questions and suggestions for prompts and probes (Sarantakos, 1993). Cohen and Manion (1989) suggested that open questions allow flexibility, i.e. they enable the interviewer to look at certain issues in more depth and to go in certain directions or to clarify misunderstandings. Open questions foster co-operation and amity. It is a valuable instrument to evaluate the respondents' convictions.

Semi-structured interviews allow the participants a greater deal of freedom in their responses, compared to the structured interviews, and at the same time they provide a greater deal of structure for data comparability over that of the in-depth interviews. However, if the researcher loses control of the conversation, the data analysis will become more difficult than in structured interviews. After the description of the method, the subsequent section outlines the reasons for its choice.

Why the current research has used semi-structured interviews

Semi-structured interviews were conducted in the current study, in an attempt to assess the data previously collected in the in-depth interviews. They use a more structured questioning scheme than the in-depth interviews, but still allow flexibility, i.e. the emergence of new insights. The semi-structured interviews permitted the research to assess the key business strategies that were important to the Portuguese mould managers and shaped the questionnaire. The semi-structured interviews enabled managers to express their feelings, beliefs, experiences and behaviour at the same time as it allowed the researcher to keep the dialogue within the theme of business strategy. The next section illustrates the selection of the target group.

The selection of interviewees: semi-structured interviews

In November 1996, fifteen top Portuguese mould managers were interviewed, at the National Exhibition Centre, in Birmingham, at the "INTERPLAS" fair. Ten of those top managers run mould manufacturing firms, and five run trade, i.e. intermediary mould firms. These managers were selected for the interviews because of the

convenience of the occasion. The relaxed atmosphere of the fair gave the managers the time required for the interview as well as the willingness to participate in the research project. The process of the sample selection is described in the following section.

Sampling selection and access to the organisation

A non-probability sampling technique in the form of convenience sampling was used to identify participants. Convenience sampling comprises the selection of cases that are the easiest to obtain for the sample (Saunders et al., 2000). It is acknowledged that this technique is prone to bias, as the cases only appear in the sample because of the facility in obtaining them. However, in the current study, bias was restrained by the little variation in the population (the interviews concerned only the Portuguese top mould industry managers), and by the fact that the sample served as a pilot study to develop the questionnaire sample.

To gain access to the participants, the researcher approached them in their own stand. The fact that the researcher addressed them by speaking their own native language, Portuguese, appeared to create a rapport, which it is believe facilitated the access. The researcher presented herself, explained the nature of the research, as well as the purpose of the semi-structured interviews. Managers promptly and amenably participated in the research project as they found the subject of very great interest. Confidentiality of the information given was assured. To strengthen, confidence in the interview purpose, the researcher's university business card was shown. The researcher was also carrying a university folder and university headed paper. Permission to take notes of the interviews was required. All the mould firms at the exhibition agreed to participate, which included thirteen top manufacturing managers and three top intermediary (trade) managers, ranging from small to medium size firms (defined in terms of the number of employees). For reasons of confidentiality the identity of the participants is to be kept anonymous. The subsequent section reveals how the method was conducted.

How the semi-structured interviews have been conducted, what has been asked, how long the interviews lasted

The semi-structured interviews of the current research followed a schedule of questions pre-determined by the researcher (Robson, 1995). The list of topic headings and possible key questions comprised a set of associated prompts. Open questions were also included in the semi-structured interviews, which as said before enabled the respondents to describe in their own words business strategy development. The schedule included a number of business strategy themes covered previously in the in-depth interviews. They comprised: the organisation's marketing policy, the organisation's market-product domain (what they were selling; what kind of mould they were manufacturing; to which countries they were selling; and which were their industries served); the organisation's workforce, their training policy; the organisation's technology profile; the organisation's competition (who they are, what are they doing), the organisation's philosophy and the organisation's competitive factors. The dynamics of strategy were also assessed: how their business strategy has been affected by the change of environmental factors over the years, such as interest rates, exchange rates, increasing competition, the Portuguese admission to the EC; how they have reacted to those changes – whether they have changed their strategy or not; how their customers' demands have changed over the period. Probes and prompts were used during the conversation. A copy of the semi-structured interview schedule can be seen in appendix 4B. The semi-structured interviews lasted between 45 minutes and one hour. After the collection of the data, the next section describes and discusses the method of analysis.

How the information has been recorded and analysed

Responses were recorded in the semi-structured interview schedule. Notes on the body language during the interviews were also registered. It is acknowledged that the gender, age, class and ethnicity of interviewers can influence the participant's responses (Alston and Bowles, 1998). In the current study, respondents were open, sincere, unreserved and straightforward in their participation in the research project, as they did not see the researcher as a threat to their business. It is suggested participants are more likely to be sincere with strangers or people who are different from them,

because they do not perceive negative impact for their business (Alston and Bowles, 1998).

The current study has used content analysis for the assessment of the semi-structured interviews. Content analysis was previously described (see page 171). The reliability and the validity of the semi-structured interviews are described in the next section.

The Reliability and Validity of semi-structured interviews

According to Easterby-Smith et al. (1996:41) reliability can be assessed in the interpretative approach by asking the question: "Will similar observations be made by different researchers on different occasions?" In the current study, the use of standardised questions in the interview schedule increased the reliability of the results, i.e. the same set of questions was maintained for each interview (see appendix 4B). Additionally, in order to reduce the researcher bias, the semi-structured interviews were designed to be neutral (Robson, 1995).

Validity is concerned with whether the results are "really" about what they appear to be about, (Robson, 1995). In order to increase validity in the semi-structured interviews the researcher made use of probes. The interviewee was asked to go over the issues again that seemed unclear to the researcher, in order to clarify any misunderstandings. This process allowed the researcher to ensure that the information given was correctly interpreted. The next section synthesis the contribution of the interviews for the current study.

5.3.2.3. Summary of the qualitative data instrument - What was the contribution of the interviews for the research project

In-depth interviews and semi-structured interviews were conducted to investigate business strategy concepts within the Portuguese mould industry. In-depth interviews allowed a deeper understanding of the subject and its context, enabling the identification of key words that describe business strategy. Semi-structured interviews assessed the data collected by the in-depth interviews with a higher degree of

standardised questions, facilitating data analysis and comparability of the results, as well as permitting the capture of new emergent business strategy issues.

The insight gained by both interviews, i.e. in-depth interviews and semi-structured interviews advanced the process of understanding the Portuguese firms' strategic behaviour, e.g. how do the Portuguese mould firms craft their strategies; and how strategy development has evolved over the years, and consequently established the foundations for the development of the hypotheses.

Furthermore, these interviews were conducted in the current study as a filter of the reliability and validity of the information to be used in the questionnaire.

Additionally to the primary qualitative data collection, i.e. the interviews, the current study has collected secondary data. The secondary data were gathered to trial the information from the in-depth interviews and semi-structured interviews and to design the questionnaire, ensuring the reliability and validity of the research findings. The secondary data collection process is outlined in the ensuing section, which discusses and analyses the advantages and disadvantages of the method, the type of secondary data gathered, and the data contribution towards answering the hypotheses and the research objectives.

5.3.3. Secondary data collection

The advantages and disadvantages of secondary data

According to Hakim (1982), secondary data are data that have been already collected for some other purpose. Secondary data have been given a variety of different classifications (see Bryman, 1995; Dale et al., 1988; Hakim, 1982; and Robson, 1995). Saunders, et al., (2000) based on the researchers' previous work, have developed a more comprehensive classification. They have categorised the secondary data into three main subgroups: (1) documentary data, (2) survey-based data and (3) data compiled from multiple sources.

Secondary data are relatively inexpensive; they permit comparisons across groups, nations, or time; facilitate replication, and allow the investigation of new issues not thought of by the original researchers. They provide a quick means of data collection with high quality standards, and because they have been previously collected, they provide unobtrusive measures (Robson, 1995). They are particular relevant in undertaking longitudinal studies, requiring a string of continuity to enable data comparability. However, secondary data also have weaknesses. The purpose of the data collected may not match the needs of the hypotheses and the research objectives, and therefore the data may be inadequate for the research project, (Stewart and Kamins, 1993); they may be difficult to gather or too costly; and the original purpose of the data may affect how data are presented. This last aspect is particular important for internal secondary data generated by organisations, such as organisation's reports or external documents like published company reports and newspapers, as data may be presented biased towards the organisations' objectives.

In the current study, secondary data were collected in order to help to develop and test the hypotheses, and to meet the research objectives. The data provided an understanding of the contextual environment of the Portuguese mould firms. They enabled comparison of the Portuguese mould industry internationally, nationally and regionally. Secondary data also enabled comprehension and identification of the environmental changes – continuous and discontinuous that have occurred in the industry, and that may influence the Portuguese mould firm's business strategy. They have permitted establishment of a relationship between the environmental changes and the Portuguese mould firms' business strategic changes. Additionally, the secondary data have permitted triangulation the information gathered from the exploratory interviews, increasing the validity of the questionnaire survey instrument. Figure 25, synthesises the type of secondary data used, the institutions from where the information was gathered, and the data contribution to the research project.

Figure 25 - The secondary data used in the current research study: types and reasons

Type of secondary data	Institution	The information enabled to:
•Written documentary data, such as organisation's catalogues, booklets; journals, magazines, newspapers and master thesis.	•Portuguese mould firms' catalogues. •Portuguese and International journals, newspapers, magazines, such as, The Injection Molding Magazine (American); O Molde magazine (Portuguese); European Plastic News (British); British Plastics Federation magazine. •AIP - the Oporto Industrial Association, produced a case study on the Portuguese mould industry	•Understand the Portuguese mould context
•Non-written documentary data, such as video recording	•ICEP - Investments, Trade and Tourism of Portugal, produced a video of the Portuguese mould industry	
•Continuous and Regular Survey based data, e.g. statistics surveys produced by the Portuguese government and other institutions	•The Bank of Portugal, produces annual reports on the exchange rate, the inflation rate, GDP, and the trade balance; • INE - The National Institute of Statistics, produces annual reports on the national exports, and imports, and also produces regional reports; •The ministry of employment produces employment statistics; •CEFAMOL - the Portuguese mould association, holds a triennial conference, and edits the respective proceedings; it is also responsible for the edition of a quarterly magazine, "O Molde".	•Understand the Portuguese mould context; • Understand and identify environmental changes and trends •Place economically and socially, the Portuguese industry, whether internationally, nationally, and regionally
• Surveys and statistics produced by other international institutions	•OECD - the Organisation for Economic Co-Operation and Development, produces annual economic reports, comprising macro- economic variables; •The Panorama European Magazine produces annual reports of the European plastic trends. •Key Note Reports, produces market research reports • ISTMA - the International Special Tooling Machining Association produces statistical information about the mould industry of the associated countries, USA, France, Spain, Italy, Germany, etc.	• Understand the overseas macro-economic indicators and trends. They are important due to the extreme dependence of this industry on the external market, i.e. 90% of the production is for exports.
•Ad-hoc statistic surveys, produced by the Portuguese governmental and other institutions	•IAPMEI - Institute for Support Small and Medium sizes Enterprises, produces regional economic reports •ICEP - Investments, Trade and Tourism of Portugal produces case studies and market research reports of the plastic and mould industry in several countries; it also produces a database directory of the Portuguese mould industry. •BPA - the Portuguese Atlantic Bank, produces statistical information of the mould industry	

The secondary data collected was mainly available in the Central Region, Marinha Grande, and in Lisbon. The following section describes and discusses the reliability and validity of the secondary data.

The Reliability and Validity of secondary data

In order to ensure the reliability and the validity of the secondary data collected, the current study has followed three steps. First, it has assessed the overall suitability of the secondary data source to the current hypotheses, i.e., i) the validity of its measurement and ii) the coverage of unmeasured variables. To ensure the validity of the measurement, the secondary data that failed to provide the information required in order to test the current hypotheses or meet the research objectives were rejected. Related to the coverage of unmeasured variables, it was ensured that the secondary data collected covered the population about which the data were needed, for the time period needed, and containing the variables that enabled the current study to answer the hypotheses and meet the research objectives. Consequently, the unmeasured variables were excluded.

Second, to evaluate the precise suitability of the data for analysis in order to answer the hypotheses and research objectives, particular attention was paid to i) validity and reliability and ii) the measurement bias of the data. Validity and reliability concerns the method of collection and the source of the secondary data. The current research has collected the data from organisations that are recognised as "reliable", mainly government institutions. Their data collection procedures and data compilation are likely to be well thought and accurate, and consequently credible. However, the validity of documentary data such as organisations' records is more difficult to access. In order to validate this type of data the current study ascertained the needs of the primary user. As suggested by Dale et al., (1988) all secondary data require a detailed assessment of validity and reliability, which involves an evaluation of the methods used to collect the data. The research assessed documentary secondary data by looking at who were responsible for collecting or recording the information, and by examining the context in which the data were collected. This was conducted in order to detect the likelihood of potential errors or biases. The validity and reliability of survey data was easier to assess, as a clear explanation of the methodology used to collect the data were provided.

Third, the current study considered the accessibility of the secondary data. The current study has compared and assessed the costs of acquiring data with its benefits (Kervin, 1999). The secondary data collection process is synthesised in the following section.

Summary of the secondary data collection

This section has described the secondary data collection process. A set of secondary data within the industry and within the environment where the industry operates, was collected: historical literature, reports, journals, articles, and economic statistical data (International, national, and regional), among others. The collection of secondary data enabled the research: a) to understand the Portuguese mould environmental context; b) to comprehend and identify the environmental changes in this context; c) to establish a relationship between the environmental changes and the Portuguese mould firms' strategic business changes; d) to triangulate the information previously collected in the interviews; e) to increase the validity and the reliability of the research results.

With the primary data collection of the exploratory interviews and the secondary data collection, the foundations for the development of the questionnaire survey instrument were created. The following section describes the questionnaire method of data collection. It outlines in detail the strengths and the weakness of the method, the sampling selection process, the questionnaire design, the pilot test, the administration of the questionnaire, the method of data analysis, and the reliability and validity of the questionnaire.

5.3.4. Questionnaire method

The advantages and disadvantages of the questionnaire

According to Saunders, et al., (2000), quantitative data are based on meanings derived from numbers, the data are collected in a numerical and standardised way and the analysis is achieved through the use of diagrams and statistics. Questionnaires are a quantitative method of data collection. Questionnaires cover all the techniques of data

collection in which each person is asked to respond to the same set of questions in a certain order (de Vaus, 1991). There are two types of questionnaires (1) self-administered, which can take the form of (a) postal questionnaire, or (b) delivery and collection questionnaire and (2) interviewer-administered, which could be (a) telephone questionnaire, or (b) structured interview. As suggested by Dillman, (1978), questionnaires are an instrument to gathered attitudinal, belief, behavioural and attributive data. Behavioural variables contain data on what people or their organisations did in the past, are doing, or will do in the future. The current research recorded behavioural data, because it was interested in knowing what the Portuguese mould managers have done, were doing, and intend to do in the future in terms of their strategic behaviour.

One of the advantages of using questionnaires is the collection of responses from a large sample, as the same set of questions is asked to each single questionnaire respondent. Questionnaires are an established sequence of broad closed questions (Robson, 1995), allowing data generalisability and data comparability. They are preferable to other methods due to the type and amount of information that they provide (Sarantakos, 1993), and because they are relatively low cost compared with interviews (Saunders, et al., 2000; Alston and Bowles, 1998). Questionnaires also facilitate data input for computer analysis. Questionnaires are broadly used in the survey data collection technique.

However, questionnaires also have weaknesses. Delays may occur in the data collection process, as researchers are dependent on others for information. Only a limited number of questions can be asked. The data collected may not be so comprehensive as those collected by the qualitative research methods. Questionnaires of extensive length are unlikely to be successfully fulfilled. It is acknowledged that they do not allow any explanation, elucidation of the questions to the respondents neither do they permit a chance to encourage, or motivate the participants to be involved in its completion. Additionally as the questionnaires are completed at the respondents' convenience and in their own environment, it is unknown under what

circumstances the participant completes the questionnaire, and they may be only partially completed.

In order to confine the described questionnaire's disadvantages, the current study has conducted a face-to-face questionnaire, i.e. a structured interview. This option also relies on the extended length of the questionnaire (comprehensive information). Longer questionnaires are best presented as structured interviews; additionally they can include more complicated questions than other types of questionnaires (Oppenheim, 1992). Using a structured interview allows a high level of confidence that the right person has responded. A face-to-face questionnaire has also enabled immediate collection of the data just after the completion of the questionnaire (with the exception of the financial data that was not promptly available, in light of the fact that information for the period 1980-96 was requested. The contamination or distortion of respondents' answers may be affected by a wish to say good things. Due to the close contact involved, respondents of structured interviews may answer to please (Dillman, 1978). However, this impact can be minimised with a large sample and high response rate.

Another outlined weakness is that questionnaires are too easy to design wrongly. To increase the success of the questionnaire design the research has used a multi-method data collection approach. Designing a questionnaire requires an exhaustive knowledge and understanding of the phenomena and its context, because the structured questions should measure the variety of options that are related to the phenomena (Oppenheim, 1992). The following section describes the reasons behind the choice of this method.

Why the current research has chosen the questionnaire method for the research design

In order to test the hypotheses and the research aims, the research has used a questionnaire method in its process of data collection. The questionnaire was selected due to its appropriateness to generalise information and to test theory. While the previous interviews allowed the researcher to develop a comprehensive understanding of the subject from a small sample of the population, the questionnaire permitted the

testing of the business strategic behaviour captured by interviews on a large population. It investigated the generalisability of the business strategy, i.e. how many firms have followed the same strategic business behaviour trend. The questionnaire was used as part of the survey strategy to collect descriptive and explanatory data on business strategy and organisational performance. The explanatory or analytical purposes enabled the research to analyse and explain relationships between business strategy and organisational performance variables, especially its cause-effect relationship. In order to distribute the questionnaire, it was required to identify the sample of respondents. The next section illustrates the process of the sample selection.

Sample selection and access to the organisation

The choice of sampling techniques is dependent on the feasibility and sensibility of collecting data to test the hypotheses and address the research objectives from the entire population. The current study attempted to statistically generalise the strategic business behaviour followed by the Portuguese mould manufacturing firms. This has required estimating statistically the characteristics of the population. Restrictions of time and money have led the researcher to the development of a probability sampling.

In order to understand the population and the sample selected in the current study, a brief description of the Portuguese mould sector is presented. The Portuguese mould sector includes (see Figure 26):

(1) Manufacturing companies for the plastic industry (injection, die casting tools, blowing, and compression); for the rubber injection industry, and for the glass industry;
(2) Trading companies, i.e. intermediaries;
(3) Specialised services, such as, design and engineering; rapid prototype, mould for light alloys, electrode design, countersinking and wire EDM services, milling and copy-milling services;
(4) Mould Base companies,
(5) Steel, and
(6) Accessories and Components companies.

As seen, the mould sector includes manufacturing firms, trading (intermediary) firms, specialised firms (providing services such as, design and engineering, rapid prototyping, mould for light alloys, electrode design, countersinking and wire EDM, milling and copy milling services), mould bases firms, and steel, accessories and components firms. The manufacturing firms can produce moulds for the plastic, rubber, glass and ceramic industries. However, the plastic industry is the most significant, representing more than 80% of the moulds exported (see appendix 4C). The moulds can be manufactured through injection, dies casting, blowing and compression manufacturing techniques.

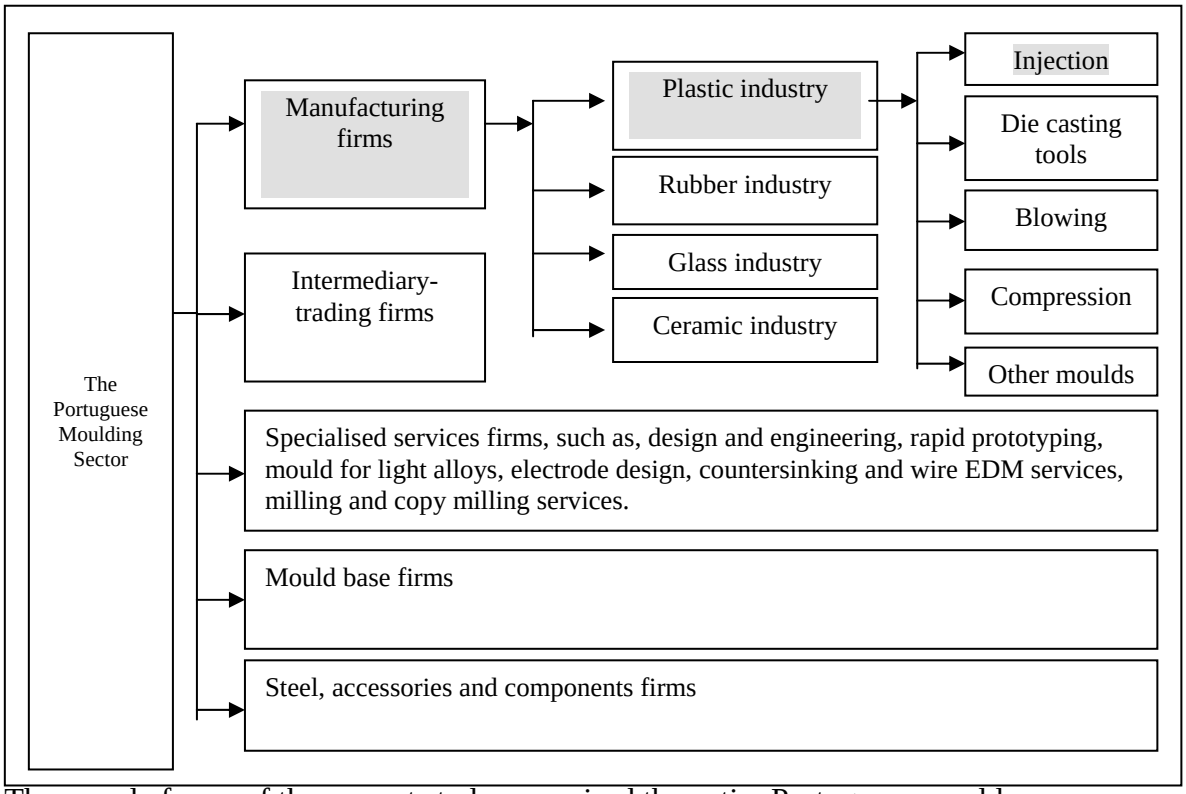
The current study has selected one single industry to be investigated - *the Portuguese mould manufacturing firms* (see Figure 26). One single industry was selected because it was believed that the benefits of tight industry control were more consistent with the validity testing aims of this research (Smith et al., 1989). Studying one single industry provides a greater degree of control over market and environmental peculiarities, as well as homogeneity. With one single industry there is a consensus with respect to the nature of the environment (Ketchen, Jr. et al, 1993). Other researchers have also analysed one single industry in their studies (see Conant, Mokwa and Varadarajan, 1990; Namiki, 1989; and Zajac and Shortell, 1989).

Three other reasons have underlined the choice of this industry: First, the geographical access of the researcher to the firms in the industry. The designated "Central Region" where the researcher lives comprises 95% percent of the Portuguese mould industry, i.e. Marinha Grande, 60% and Oliveira de Azeméis, 35 %[1]. Second, the Portuguese Association for the Mould Industry - CEFAMOL, regularly publishes information about the sector, is located in Marinha Grande. Other national institutions, such as: ICEP -Investments, Trade and Tourism of Portugal (equivalent to dti) and the INE - the Portuguese National Institute of Statistics, also produce regular information about the sector. Therefore, secondary data about the industry were available. Third, this industry has been undergoing significant changes: increasing competition, new

[1]Source CEFAMOL, 1996

technological developments, and economical and political changes, which permitted the current research to test the hypotheses and portray a variety of different settings. It is believed that these changes would elicit a variety of organisational responses. Many firms were experiencing some form of organisational adjustment: entering or dropping certain markets, modifying technologies for producing, altering organisation structure and so forth. In sum this industry allows the study of the organisation strategy within a changeable and uncertain environment.

Figure 26 - The Portuguese moulding sector



The sample frame of the current study comprised the entire Portuguese mould manufacturing firms in the Portuguese mould association database. It can be said that the sampling frame selected is biased towards the mould manufacturing firms that do not subscribe to the association. However, as discussed in the following section, the sample is highly representative of the population, which means that the remaining existent firms in the market, which do not subscribe to the association, are contributing with a very small part indeed of the national turnover. A probability sampling technique was used in the form of a simple random. Probability samples give to each person an equal chance of being included in the sample size equally likely, chosen at random. Random numbers enabled the selection of the sample to be made without

bias. A simple random frame was appropriate for the current study as an accurate and easy access to the sampling frame was obtained. The next section illustrates the representativeness of the sample.

Representativeness of the sample

The larger the sample size, the lower the likely error in the generalisation to the population. A perfect representative sample is one that exactly represents the population from which it is taken (Saunders, et al., 2000). The Portuguese mould association database consists of 97 mould manufacturing firms (n=97). The current study administered the questionnaires to 63 firms; as a result, the response rate of the current study is 65%. The turnover of the sample selected when compared with the sector turnover represents 68% of the total sector[2], (the sector production is 42.581.304 billion Escudos at 1996 prices[3], and the sample production[4] is 29 122 031 billion Escudos). Therefore, the sample selected can be said to be representative of the whole population.

In order to gain access to the organisation's top managers the researcher made several phone calls until she was able to reach them. On the phone, the researcher introduced herself, explaining clearly and concisely the nature of the research, the objective questionnaire, and approximately how long it would take to complete. Confidentiality of the information given was ensured and they were also assured that the purpose of the research project was purely academic. Consent was then given by the top managers and an appointment was arranged. The completion of the questionnaire took place in each of the top managers' organisations. The following section describes and discusses the questionnaire design, the variables and measures used by the current study.

Questionnaire design, Measurements and Variables

[2] It is important to emphasise that the sector includes manufacturing, intermediary-trading, specialised, mould based and steel firms. The sample of this research only accounts for mould manufacturing firms, which strengths the representativeness of the sample.
[3] Source: ICEP – Investments, Trade and Tourism of Portugal and CEFAMOL.
[4] it was assumed that the value of production equals the value of the turnover, as all the orders are assumed to be sold.

The questionnaire was designed to test the current study hypotheses. According to Saunders, et al., (2000), there were three ways of designing the questionnaire's questions: a) using the same questions previously used in other questionnaires; b) adapting the questions previously used in other questionnaires; or c) developing one's own questions. Using questions from previous studies enables the comparison of research results with former studies. The current study, due to the absence of research on business strategy and organisational performance within the Portuguese mould industry, has developed its own questions.

The questions were designed to follow a certain sequence to enable flow and progression in the completion of the questionnaire and to appear logical to the respondents. The questionnaire begins with a broad question about the organisation's details, e.g. postcode, and nature of the ownership and concludes asking about a more delicate and sensitive issue - the organisation's financial indicators. The wording chosen was carefully selected and it was ensured that it was familiar to and understood by the Portuguese mould managers. The questionnaire also used filter questions.

The questionnaire made use of closed questions, which were mainly utilised, and some open questions. Closed questions were employed because they require minimal writing, they are quicker and easier to answer, and they are easy to compare. In the current study, closed questions provided a number of alternative answers from which the Portuguese mould managers were asked to choose (de Vaus, 1991). According to Youngman (1986), there are six different types of closed questions: (1) list, (2) category, (3) ranking, (4) scale, (5) quantity and (6) grid. The current study has utilised most of the different types of closed questions, and consequently measured categorical data, i.e. categorical descriptive or nominal data and categorical ranked or ordinal data, and quantifiable data, i.e. quantifiable continuous and quantifiable discrete data. Lists questions enable a range of possible answers for the participants to be considered. List and category questions were utilised because they are appropriate for collecting data on behaviour (Saunders, et al., 2000). A five-point Likert-style rating scale (1= strongly disagree to 5 = strongly agree) was used to collect attitude and belief data.

Quantity questions or also refer to as self-coded question, e.g. percentages, any kind of numbers, were utilised to measure both business strategy and financial organisational performance. One of the disadvantages of closed questions is that, due to the length limitations of the questionnaires, they may not embrace all the alternative answers and therefore the respondents' desired answer may not be shown. In order to overcome this, the current study has also utilised some open questions.

The questionnaire comprises eleven separate sections, ten of which are related to business strategy and one related to financial organisational performance measures, covering 42 questions. A copy of the survey instrument can be seen in appendix 4D. They were developed to measure business strategy in the Portuguese mould industry, to test the applicability of Miles and Snow's (1978) strategy types within the Portuguese mould industry context, and to measure financial organisational performance, both in the static and dynamic perspective for which, five time periods were selected 1980-86; 1987-92; 1993-95; 1996; and 1997 (a forecast). For the static viewpoint each of the timescale was analysed. For the dynamic viewpoint, change is analysed from one period to another, i.e. from 1980-86 to 1987-92; from 1987-92 to 1993-95; from 1993-95 to 1996 and from 1996 to 1997.

A table was drawn up (see appendix 4E, Table 4Ea) to illustrate the variables employed in the current study, to measure business strategy, organisational performance, and Miles and Snow's strategy types, both in a static and dynamic perspective.

Business strategy variables were measured through the development of strategic dimensions, and within it, several variables were considered. Strategic dimensions comprise: product-market domain, investments, marketing policy, people-knowledge, organisational management, technology, customers, competitors, suppliers and environmental trends (see appendix 4F). All the scales used in the questions, e.g. 2f) industries served; 2g) capacity-the interval scale selected for the capacity and the definition in kg; 4-technology-the type of technology chosen, etc, were developed based on the top managers' information given in the interviews. A definition of

complexity level of the manufactured mould (see question 2h) and quality (see question 7a) was given to the top managers. This has ensured that all the top managers in the current research understood the questions in the same way. The top managers were asked to identify the complexity of their organisation's manufactured mould, by using as an example a scale which has at one extreme a basin mould, recognised as a simple mould, and at the other extreme, a set of electrical parts that are interconnected, recognised as a highly complex mould. Quality was defined as the quality of the manufactured mould, which reflects the customer's requirements in terms of the measurements and the mould utility.

To test the applicability of the Miles and Snow's strategy types, the current study has used a perceptual Self-Typing paragraph approach. According to Snow and Hambrick (1980), and Conant et al. (1990) the identification and measurement of strategies can be achieved through four broad approaches: (1) self-typing; (2) objective indicators; (3) external assessment; and (4) investigator inference. The paragraph approach has been the most widely employed to operationalise Miles and Snow's strategy types. Researchers have provided strong support for the reliability and validity of the self-typing paragraph approach to measure the strategic archetypes (see Conant et al., 1990, Shortell and Zajac, 1990; James and Hatten, 1995). The paragraph approach requires each respondent to read four short, unlabelled, paragraph-length descriptions of each of the four strategy types, and then select the *one* description that best characterises their organisation. In the current study, as it was analysed a dynamic perspective, the top managers were asked, for each timescale, which of the unlabelled paragraphs best fit their organisation compared with other organisations (see question 10e, in the questionnaire form, appendix 4D).

Among the merits of the paragraph approach is that it can be easily completed and interpreted; all four strategy types can be captured. Therefore, this method is useful with large samples. However, the self-typing approach has shortcomings: it employs a single-item scale, over simplifies the archetypes-paragraph description, and top managers may be inclined to report their organisation's intended strategy rather than their emergent or realised strategy (Snow and Hambrick, 1980). The current research

in order to overcome this weakness used a timescale 1980-97, which allows the top managers' realised strategy (1980-95), their current strategy (1996) and their intended strategy (1997) to be portrayed. Other researchers have used the same approach to validate Miles and Snow's strategy types (see McDaniel and Kolari, 1987; Conant, Mokwa and Varadarajan, 1990; Shortell and Zajac, 1990; James and Hatten, 1995); this enabled the comparison of the current research findings with prior studies.

Researchers have reported that multiple measures of performance are important, as they are likely to be affected differently by environmental factors (Osborn et al., 1980). Any given measure is subject of criticism (Weiner and Mahoney, 1981; Hofer, 1983), therefore using multi indicators is important and increases the validity of the measures.

Profitability is often used as a financial performance measure, namely return on equity (ROE), and return on assets (ROA), (Venkatraman and Ramanujam, 1986). Measures of profitability indicate how well the organisation is able to take available inputs and transform them into valued outputs. Return on assets and Growth measures are considered the best indicators of the overall financial health of organisations, (Osborn, et al., 1980). ROA is a good ratio in measuring efficiency. Return on sales (ROS), is also commonly used as a financial measure of a firm. Based on the literature reviewed, the current research in order to ensure the validity of the research findings has selected a comprehensive wide range of financial organisational performance measures. This choice was based on the most often used traditional financial indicators. The ratios selected are described bellow:

i) Profitability. Profitability ratios[5] comprise a) Profit margin, b) Return on equity - ROE, and c) Return on assets - ROA

   a) Profit margin ratio - (net profit after tax/ turnover x 100), measures the profits earned per pound of sales. It assesses the efficiency of the operation. This ratio is an indicator of the business' ability to resist adverse conditions

[5] The profitability ratios were all calculated with the net profit after tax, however they can also be calculated with the profit before tax.

such as falling prices, rising cost or declining sales. Other researchers have applied the same ratio to measure organisational performance (see Zajac and Shortell, 1989).

b) *Return on equity ratio - ROE,* (net profit after tax/capital employed x 100), measures pre-tax profit to the long-term investment in the company. It is a good measure to assess whether sufficient return is being generated on the long-term funds employed by the business. If the ratio is low, liquidity problems are likely to develop. Hatten and Schendell (1977), Kim and Lim (1988); Hambrick, (1983), Ketchen et al. (1993) and Thomas and Romaswamy (1996) have utilised the same ratio.

c) *Return on assets - ROA* (net profit after tax/ total assets x 100). This ratio is a key indicator of the organisation's profitability. It assesses the operational profits with the assets available to earn a return. A ratio with a high return indicates that firms are using their assets efficiently and vice versa. Snow and Hrebiniak (1980), Dess and Davis (1984), Kim and Lim (1988), Lawless and Finch (1989), Ketchen et al. (1993), Bantel and Osborn (1995) and Thomas and Romaswamy (1996), have used this ratio in their research. Namiki, (1989), Slater and Narver (1993) and Smith et al. (1989) have used it as subjective self-report instrument.

ii) Return on sales - ROS (total assets/turnover), assesses sales with the total investment that is used to generate those sales. A low ratio indicates that firms are carrying more assets than necessary for their sales volume which can led an organisation to financial difficulties. Extremely high ratios indicate either a style of management, which is seen to be too conservative, or too low a level of turnover. This ratio has also been operationalised by Lewis and Thomas (1990), and Thomas and Romaswamy (1996).

iii) Sales Growth rate - SGR, reflects how well an organisation relates to its environment. Dess and Davis, (1984) and Kim and Lim, (1988) have also employed

the same business financial measure. Namiki, (1989), and Smith et al. (1989) have used it as a subjective self-report instrument.

iv) Sales/number of moulds, this ratio illustrates the added value that it has been increased to the moulds. If the ratio is increasing over time, it shows that firms are producing fewer moulds but more expensive moulds, i.e. they have certain characteristics that mould makers can ask for a higher price.

v) Asset intensity (total assets /employees), evaluates the assets employed per employee. The higher the ratio the greater the asset intensity. Hambrick (1983), and Thomas and Romaswamy (1996) made use of this financial ratio.
vi) Sales per employee (turnover/employees), this ratio provides an indication of the efficiency of the workforce. Frazier and Howell (1983) also have used this ratio.

vii) Profit per employee (profit before tax/employees), this ratio shows how effectively the workforce is utilised. It is a key ratio to measure the productivity of labour investment.

In order to build up the ratios described, the current research asked top managers for financial data from the balance sheet and the profits and loss sheet (e.g. fixed assets, cash, debtors, other current assets, stocks, suppliers, short term liabilities, long term liabilities, equity capital, net profit after tax, net sales revenue) as well as the number of employees and the number of moulds produced.

Additionally, to complement the organisational performance analysis the current study used the organisational' product cost structure: raw material; subcontracts; workforce; technology; components/accessories; capital costs, and the number of moulds manufactured to compare performance among firms.

The financial data were collected for the timescales 1980-86; 1997-92; 1993-95 and 1996. The number of employees per firm was asked only for 1996. In order to facilitate the financial data collection and to enhance stability of each performance

indicator an average of the data for each period was required (see Hambrick, 1983; Miller, 1988; Thomas and Romaswamy, 1996). The data for 1980-86 were calculated by using the extremes of the interval, divided by two: 1980+1986/2. All the Portuguese firms are obliged to use the same accounting system, therefore the validity of the financial data required was ensured. Additionally to overcome any possible mistranslation of the financial measures, the balance sheet and the loss and profit sheet were carefully examined. The researcher and a British expert, (lecturer and consultant) in the field have spent several hours cautiously examining both accounting systems, the British and the Portuguese. This process ensured the validity of the organisational performance ratios used.
Thus, the current research strengths related to organisational performance measures are:

1) The use of a combination of financial organisational performance measures rather than only one or two that most of the researchers have employed. This has increased the confidence in the firm's organisational financial performance measures.
2) The use of financial ratios rather than the use of the subjective self-reporting financial ratios, i.e. the evaluation of the firm's performance compared with competitors' based on financial ratios.
3) The employment of performance measures for the longitudinal time-scale, i.e. the organisational performance measures accompanied the business strategy timescale. As a result, it was possible to analyse the impact of the dynamics of strategy on organisational performance.

Therefore, there is no reason to believe that the measures used are not accurate indicators of organisational performance. The current research expected with these procedures to increase the validity and reliability of the results as well as its richness of significance.

As mentioned previously, five timescales were selected: 1980-86, 1987-92, 1993-95, 1996 and 1997 (a forecast). These time periods were chosen to reflect different eras in

the evolution of the industry, and to analyse how managers have reacted to those changes. According to the managers, they reveal changes in the environment. The 1980-86 periods were golden years for the industry. This period was characterised by quick growth of the industry, little competition, high American dollar-escudo exchange rates[6] and grow of the international economy. The subsequent periods were years of instability; environmental changes. An international economic crisis at the end of the 80's and beginning of the 90's, increasing competition, and the fall of the dollar-escudo exchange rate, were responsible for this decline. The current study has divided the "recession period" into two, because organisations do not change their strategy immediately after the economic crisis. The two periods 1987-92, 1993-95 attempted to assess the organisation strategic change and its impact on the following years. The year1996, endeavoured to measure the current strategy, and the year 1997, intended to measure how managers were seeing the future, i.e. the intended strategy.
The dynamic perspective allowed the current study to assess strategic business change and organisational performance change both within the Portuguese mould industry and the Miles and Snow's strategy types. It permits analysis of change from one strategy type to another and evaluation of its impact in terms of organisational performance.

The questionnaire was designed with the intention of generalising the conclusion across the whole population, i.e. the Portuguese mould manufacturing firms. To ensure the reliability and validity of the designed questions, a pilot test study was conducted, described and discussed in the following section.

Pilot study

Before the administration of the survey instrument, the current study pilot tested the questionnaire. The questionnaire was given to the six managers previously in-depth interviewed. Those managers were selected to assess the questionnaire, because they have a deeper understanding of the industry and its context. They are differently

[6] As it was explained previously in Chapter 3 – the Portuguese mould industry context, the high exchange dollar-escudo rate has benefited the Portuguese mould managers in this period. If the exchange rate increases between the mould order and the mould handling, the manager makes a profit due to the exchange rate differential.

positioned in the industry and they have different points of view, ensuing that the information analysed was clearly and objectively understood by all. The number of people included in the pilot test was sufficient to include any important variation in the population that would be likely to influence the responses.

The questionnaire was shown to the top managers and they were asked to identify those questions, which were less understandable or ambiguous, or not meaningful to measure business strategy, the dynamic of strategies, the impact of environmental factors on business strategy, strategic change, or organisational performance within the Portuguese mould industry context. The managers were also asked to identify missing issues that they thought would be vital to a measurement of business strategies and which were not present in the questionnaire. Comments were received and improvements made. Minor amendments took place.

The pilot test ensured that the managers had no difficulties in understanding or answering questions (Fink, 1995). The pilot study was conducted to refine and ascertain the comprehensiveness and the phrasing of the questionnaire items. It enabled the researcher to ensure that the questions had meaning, were clearly and easily understood, the wording was appropriate and clearly communicated, that the layout and the sequence of the questions made sense and flowed, and that the questions were suitable for the respondents. The pilot test also allowed an assessment of how long the questionnaire took to be completed, the clarity of the instructions, and whether the managers found the questionnaire enjoyable and pleasant to answer (Bell, 1999).

Additionally, the pilot study assured that the questions provided the information required in order to be able to test the hypotheses and the research objectives, as well as acknowledging whether the questionnaire would succeed (Bell, 1999). The pilot study increases the reliability and the validity of the data to be collected. After the questionnaire was pilot tested, it was ready for distribution. The subsequent section describes the group with which the questionnaire has been carried out.

When, where, with whom, and why the questionnaire has been carried out

During January-February 1997 and August 1997, a questionnaire was carried out with 63 top managers of the Portuguese mould manufacturing industry at their firms. Top managers were selected to respond to the research instrument, because it is acknowledged that they have the strategic knowledge of the firm. They have a full understanding of the organisation and they have the information to delineate its strategic direction. They have the advantage of viewing the organisation as an entire system (Snow and Hrebiniak, 1980). As Chandler (1962) suggested, the chief executive is the most important in the strategy formulation process. Top managers also have many years of experience and consequently it is believed that they have a great deal of commonality in the meaning attached to business strategy. In the Portuguese mould industry, all the firms are small and medium size enterprises according to the European Community's definition. Therefore, CEO in SMEs is identical to the firms' top managers, which in most cases are the firms' owners. Other researchers have conducted their studies based only on top managers (Snow and Hrebiniak, 1980, Conant, Mokwa and Vararanjan, 1990). The ensuing section outlines how the questionnaire has been conducted.

How the questionnaire has been administered, what has been asked, and how long it lasted.

The questionnaire was carried out with a single respondent per organisation. After exchanging greetings between the manager and the researcher, the completion of the questionnaire was initiated. A brief presentation of the research purpose was made, and the questionnaire was given to the respondent. The way to answer the questions was explained and exemplified, e.g. the meaning and the utilisation of the Likert-scales, as well as was a definition of variables such as quality and the degree of complexity of the moulds manufactured (see appendix 4G). This ensured that each question was equally understood by each respondent, eliminating the existence of any possible bias. Objectivity and neutrality were engaged by the researcher to attest to reliability of the results.

A copy of the questionnaire was given to the top manager and another was kept by the researcher. The researcher read the questions aloud to the manager and according to what he/she said filled in each single question of the survey instrument. This process was undertaken in order to facilitate and hasten the completion of the questionnaire. The completion took 45 minutes on average. The questionnaires were collected after completion with the exception of the financial information that was not immediately available due to the timescale requested (1980-1996). This was sent later by fax.

No one other than the researcher had access to the questionnaires. After the collection of the questionnaires, the data was prepared and put into the statistical software package, called Statistical Package for Social Sciences, usually known as SPSS. Data preparation and the tests used will be discussed in detail in the following section.

Data preparation, data input into SPSS

After the collection of all questionnaires, the next step towards data analysis was data input into a SPSS spreadsheet. Sixty-three questionnaires were collected, of which three did not return the organisational performance financial information, which means that the financial data were only available for 95% of the sample. Each of the items in the questionnaire had been pre-coded and these codes and their descriptions were entered into SPSS. Each variable was given a similar name to the question, so that they could be easily identified once the data had been entered. A number was also given to each firm's questionnaire. This has enabled rectification of missing values. The data were entered following the questionnaire layout. This facilitated the allocation of the variables, when analysis was required. Open-ended questions were categorised, which was possible due to the limited number of open questions. Once the data had been entered, the data errors, e.g. mis-types and missing values were checked. Frequencies were also conducted to detect any data entry mistakes. Corrections were made accordingly. After entering the data into SPSS the data was analysed. The following section illustrates the questionnaire method of analysis.

Questionnaire method of analysis

For the analysis of the results, the research has used the SPSS. This software allowed the researcher to categorise, explore, and analyse the data. The SPSS quantitative data analyses used in the research were theoretically based on Bryman and Cramer (1999). For further details see appendix 4H. The quantitative data comprised categorical descriptive or nominal data; categorical ranked or ordinal data; quantifiable continuous and quantifiable discrete data.

The data were analysed according to the current study hypotheses and objectives. The analysis has ranged from descriptive statistics to testing significant relationships. There were two stages of analysis, which involved both the static and the dynamic viewpoint.

First, univariate analysis - descriptive statistics in the form of frequencies were used to analyse business strategy statically. Descriptive statistics enable variables to be described and compared numerically. It looks at each of the variables independently. To analyse the dynamics of business strategy, and its trends, line graphs, histograms and bar charts were developed. The dynamic analysis of business strategy was achieved through line graphs (Sparrow, 1989), histograms and bar charts (Saunders, et al., 2000).

Second, relationships between business strategy and organisational performance variables were explored. To assess relationships, interdependency and significant differences between business strategy and organisational performance variables, cross-tabulation were used for both the static and the dynamic analysis. The above analyses were selected to explore business strategy, the dynamics of strategy and the overall impact on organisational performance within Miles and Snow's strategy types. The subsequent section outlines the reliability and the validity of the questionnaire.

The Reliability and Validity of the questionnaire

As seen previously the current study has taken several steps in order to ensure the reliability and validity of the results. First, in order to ensure that adequate and correct key business strategy elements were measured and collected with an aim of testing the hypotheses and the research objectives, the current study in its first stage of primary data collection has conducted in-depth interviews.

Second, to report back the information collected in the in-depth interviews, semi-structured interviews were applied. The semi-structured interviews permit a higher degree of question standardisation without losing the flexibility and adaptability characteristics of the interviews. The interviews enabled a rich understanding of the business strategy phenomena and its context within the Portuguese mould industry.

Third, to trial the information collected by the interviews, the current research has collected secondary data. Historical and statistical data were gathered and analysed. This has permitted triangulation of the preceding information. At this stage, i.e. with the data collected from the interviews and the secondary sources, the current study has established and defined the questions needed for the construction of the questionnaire. The employment in the research of different methods of data collection minimises the possibility of the questionnaire being wrongly designed.

Fourth, the questionnaire was pilot tested before being administered. The objective was to assess whether the questionnaire comprised a suitable, clear and understandable wording and layout, easy to complete by the respondents.

Fifth, the employment of a questionnaire as a survey research instrument has increased data reliability (Robson, 1995). Questionnaires use standardised questions, and respondents are asked to answer the same set of questions.

Sixth, the current study has employed multi-methods and approaches, which has allowed triangulation of the information collected, using data triangulation and source triangulation.

In sum, all the different steps taken by the current study were developed towards enhancing reliability and the validity of the research results. Multi-item scales are need for appropriate reliability and validity assessment. It is necessary to move away from nominal and single-item scales towards multi-item measures that provide a higher level of discriminatory power and lower levels of measurement error (Venkatraman and Grant, 1986). Employing multiple approaches in the operationalisation and measurement of fundamental organisational constructs would allow the validity of the research findings to be enhanced (Ramanujam and Venkatraman, 1986; Snow and Hambrick, 1980). The ensuing section summarises the questionnaire method undertaken by the current study.

5.3.4.1. Summary of the questionnaire method

This section has outlined the second stage of the primary data collection process of the current study, i.e. the questionnaire method. It has discussed the strengths and weaknesses of the questionnaire, the sampling selection, the questionnaire design, i.e. the measures and variables used, the pilot test employed, the administration of the questionnaire, the method of the data analysis, and the reliability and validity of the questionnaire. The questionnaire data collection method was employed in an attempt to describe and generalise the Portuguese mould manufacturing business strategy and organisational performance behaviour. After the description and discussion of the research method design, the following section outlines the strengths and weaknesses of the research methodology.

5.4. Research methodology strengths and weaknesses

As mentioned before, the current study has engaged a hybrid strategy, i.e. a multi approach multi method of data collection. The employment of a hybrid approach has constituted one of the strengths of this research; First, because the use of combined approaches and methods highlighted their strengths and limited their weaknesses. Second, because it has enabled a holistic view of business strategy and its context within the Portuguese mould industry to be taken. The rich and comprehensive data

collected has permitted the development of a questionnaire research instrument, which increases confidence in the results. Third, because the use of a hybrid strategy has increased the reliability and validity of the research results.

One of the weaknesses of the current study is the difficulty in controlling business strategy variables. Based on the interviews conducted and on the secondary data collected, the business strategy variables used in the questionnaire were those that were repeatedly emphasised by the Portuguese mould industry's managers. However, the research acknowledges that other strategic variables, which were not included in the questionnaire, and not mentioned by the top managers, such as the organisation's leadership, or organisation's culture, may influence the organisation's business strategy. Economical and time constraints prevented the inclusion in the questionnaire of all the possible variables that may affect business strategy. The generalisability of the current research findings was pursued with the recognition of this fact. The dimensions or variables used in the questionnaire do not end the concept of strategy, but they do consider many of its important elements.

Another aspect, which could be mentioned, as a weakness of the current research, is that more non-financial measures of organisational performance could be used. However, time and cost restrictions restricted the applicability of other organisational performance variables. The organisational performance variables employed in the current study seem to satisfactorily test the hypotheses and the research objectives. The research methodology has been portrayed and examined. The next section recapitulates and synthesises the research project methodology.

5.5. Conclusions from the research methodology

This chapter has described the methodology followed by the current study towards answering the hypotheses and meeting the research objectives. It has discussed the research philosophy, the research strategy and purpose, and the different methods of data collection. The current research methods have ranged from exploratory interviews, i.e. in-depth and semi-structured interviews to a descriptive and

explanatory survey questionnaire. All the methods employed have been considered in detail: their strengths and weaknesses, how they have been conducted, their method of analysis, and their reliability and validity. The use of a hybrid strategy, i.e. the use of different methods of data collection - qualitative, through in-depth interviews and semi-structured interviews and quantitative, through the administration of a questionnaire, as well as different approaches, different research strategies and purposes, has established credibility and confidence in the research findings. The utilisation of the triangulation method has enabled the current study to capture a complete, holistic view of business strategy and organisational performance within the Portuguese mould industry. The employment of multi methods permitted the advantages of each method to be gained whilst at the same time minimising its disadvantages. The strengths and the weaknesses of the methodology employed have been also illustrated. This chapter is particularly relevant for the replication and development of further research. The following chapter describes and analyses the results of the current research project.

CHAPTER 6

Findings and Data Analysis

6.0. Introduction

The aim of this chapter is to analyse the data collected and to discuss the results in the context of the conceptual framework and the research hypotheses developed earlier. The chapter comprises seven main sections. The first section, explores the applicability of Miles and Snow's strategic typology and the strategy types from a static perspective using a cross-sectional approach based on five different timescales (1980-86, 1987-92, 1993-95, 1996 and 1997). The prime objective here is to identify trends in the key variables over different time periods. First an overview is provided of events in general terms and the effect they had on all firms; this is followed, second, by an attempt to find whether different types of firms (using Miles and Snow's typology) displayed different trend patterns. In the second section, the objective is to explore whether different strategy types are associated with different levels of organisational performance, again using cross-sectional analysis.

The third section analyses and discusses Miles and Snow's strategy types from a dynamic viewpoint, using longitudinal analysis across the five time periods (1980-86, 1987-92, 1993-95, 1996 and 1997). It explores how business strategy evolved over the period, whether firms responded to environmental changes by changing their strategy or whether they merely extended it, and if there are patterns in how firms changed from strategy type to specific strategy type. An additional aim, covered in the fourth section of the chapter, is to improve our understanding of the relationship between the dynamics of strategy and organisational performance. Here the objective is to test if firms that changed their strategy outperformed those that maintained their strategic position, and whether firms that changed from one specific strategy type to another outperformed those firms that changed to another strategy type. The fifth section explores the validity of the "self-typing paragraph approach". As the research employed the self-typing paragraph approach to identify strategic types, it was important to test

the consistency of the self-typing paragraph approach as an effective measure of distinguishing strategic types. This was achieved by testing the outcomes of the approach against the opinions elicited by the researcher during in-depth interviews with the firms concerned. The sixth section contains a synthesis of the findings, and draws up a set of conclusions. The seventh section uses the findings and conclusions to refine the conceptual framework and build up the model.

6.1. Exploring Miles and Snow's strategic typology from a static viewpoint

This section of the analysis concerns the study of Miles and Snow's strategic typology and their strategy types from a static perspective, using cross-sectional analysis (the shaded section in Figure 27). Based on the theoretical framework provided by Miles and Snow (1978), the following hypotheses were tested:

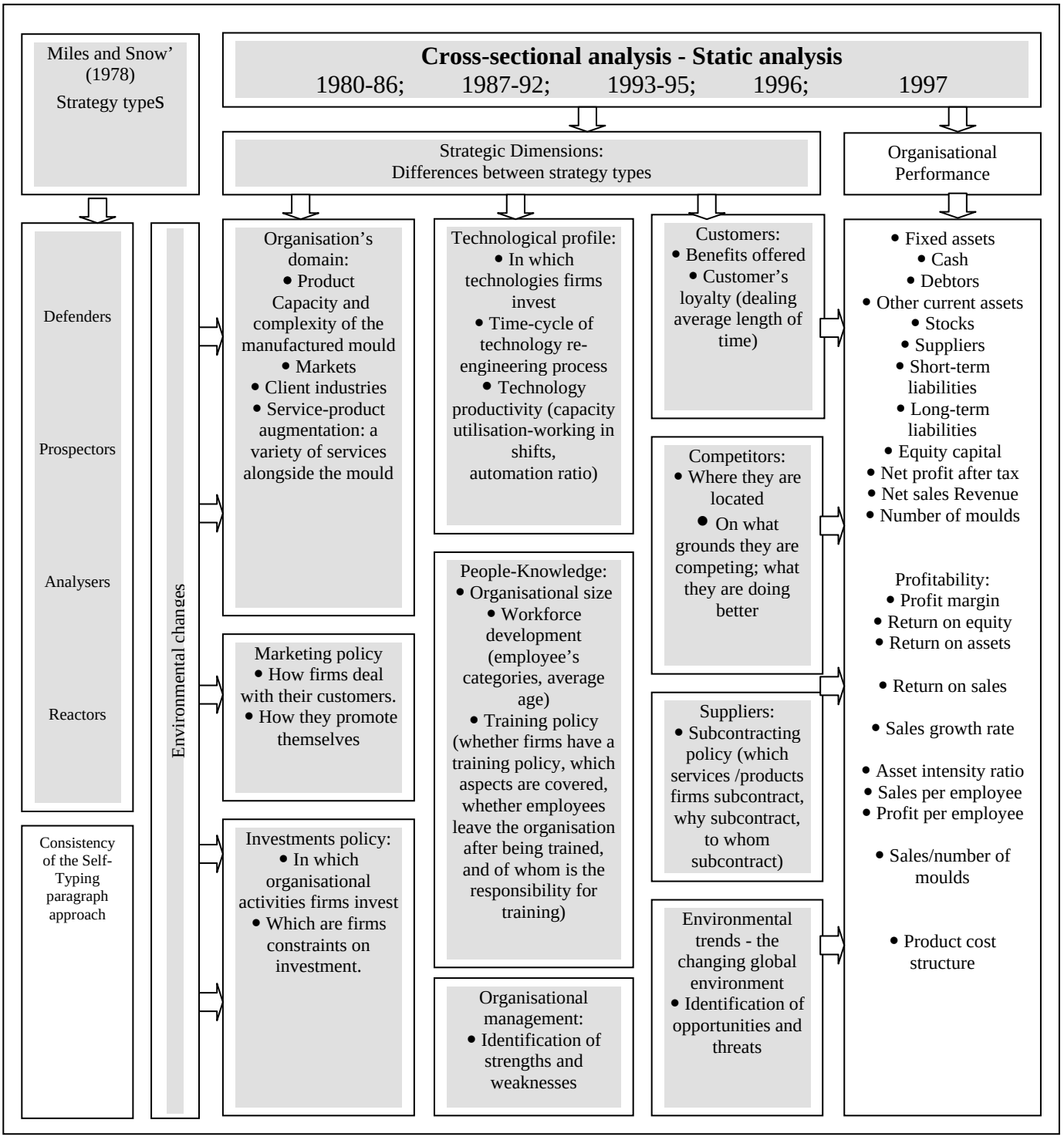
H1. The Miles and Snow's typology of business strategy is applicable to the Portuguese mould industry.

H1.1. Defenders, Prospectors, and Analysers are about equally distributed and far outnumber Reactors for the period analysed (1980-86, 1986-92, 1993-95, 1996 and 1997).

In order to investigate the above hypotheses, the respondents were asked to identify, using the self-typing paragraph approach, which type best characterised their organisation for five time periods.

From 1980 to 1997, the findings show that all four strategy types were found to exist in the mould industry, with Defenders, Prospectors and Analysers far outnumbering Reactors. The low number of Reactors conforms to Miles and Snow's (1978) and Snow and Hrebiniak's (1980) findings, as they argued that Reactors are not viable in the long term, and therefore that few Reactors would be expected. Here, Reactors accounted for only 4% of firms (3 out of 63 firms).

Figure 27 - The conceptual framework: static perspective

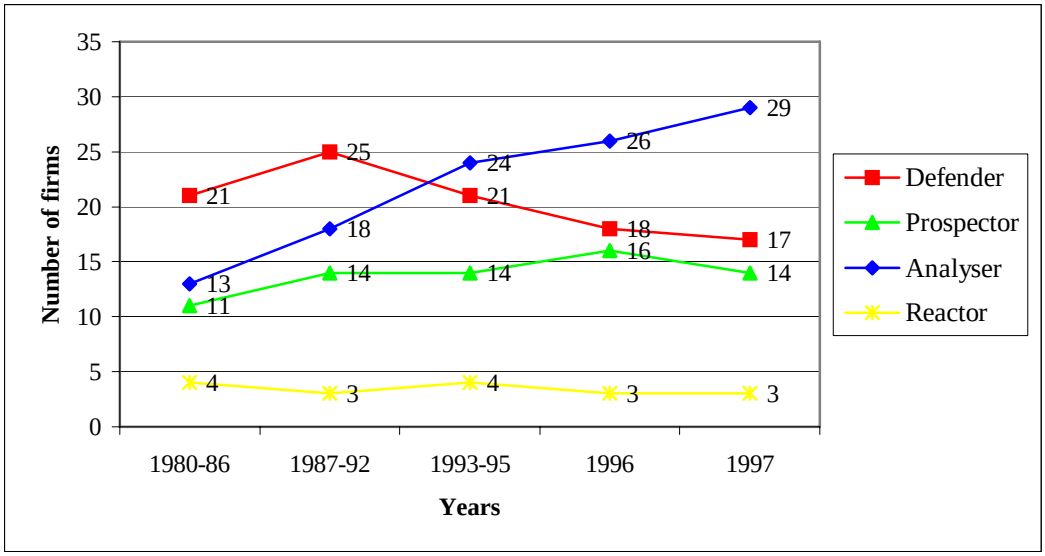


As with Miles and Snow's original research (1978), Defenders, Prospectors and Analysers far outnumbered Reactors. However, Miles and Snow's (1978) notion that Defenders, Prospectors and Analysers should be roughly equally distributed was contradicted, and it was clear (from Figure 28) that the mix of strategic types changed

over time. Defenders were the dominant strategic group in 1980-86 and 1987-92. Afterwards, the number of Defenders continued to decline as the numbers of Analysers gradually increased, becoming from 1993 onwards the dominant strategy type. Analysers continued to increase from 1980-86 (when they represented 26% of firms) through 1993-95, 1996 and 1997 (when they represented 38%, 41% and 46% of total firms respectively). It is noticeable that the number of Prospectors remained relatively constant across all time periods.

Figure 28 - Frequencies, Miles and Snow's strategy types, 1980-97

Strategy types	1980-86	1987-92	1993-95	1996	1997
Defender	21	25	21	18	17
Prospector	11	14	14	16	14
Analyser	13	18	24	26	29
Reactor	4	3	4	3	3
Total	49	60	63	63	63



The research findings corroborate the previous research of Snow and Hrebiniak (1980). Snow and Hrebiniak (1980) revealed that Defenders, Prospectors and Analysers were not about equally distributed. They found that more numerical evidence was found for Defenders and Prospectors, and that Reactors outnumbered all the strategy types, especially in the highly legislated air transportation industry, where competitive forces were dictated by government rules.

As reported in Chapter 3, the 1980's were years of prosperity and economic stability when the demand for moulds exceeded supply. Consequently, it was then relatively easy to succeed in the mould industry; there was room for everybody and levels of competition were low. The finding that Defenders predominated in a period of relative economic stability and low competition (1980-86 and 1987-92) supports Miles and Snow's assertion that adopting a Defender's position gives firms a high degree of fit with their external environment when levels of competition are low.

After a period of relative environmental stability (1980-1986), the Portuguese mould industry experienced substantial environmental changes (especially in 1987-1992). These were caused by an international economic crisis, the variation in exchange rates (Escudo:US$), growth in competition, increasing demands from customers, technological developments and Portugal's admission to the European Community. Analysers try to adopt a more "balanced strategy" and operate in two types of product-market domain: one relatively stable, the other changing" (Miles and Snow, 1978:29). The dominance of Analysers after 1987-92 can therefore be explained by the changes that occurred in the environments of these businesses. The results tend to conform to the theory: for the stable period of 1980-1986, Defenders predominated, and for the latter periods, where the environment was more unstable and competitive, Analysers predominated. It is important to emphasise that firms do not change their strategy immediately, or simultaneously with the environmental changes. Strategic change, if there is to be change, might occur gradually over a period of time. Therefore, the environmental changes that had begun to appear in the latter part of the 1987-92 time period had an impact on the strategic behaviour of firms from 1993-95.

To summarise, the analysis reveals a number of points that support several of Miles and Snow's propositions. Managers in the mould sector were able to allocate their companies to the four Miles and Snow's strategy types. As predicted, Defenders, Prospectors and Analysers far outnumbered Reactors and the findings were generally consistent with Miles and Snow (1978) and Snow and Hrebiniak (1980). However, Miles and Snow's (1978) notion that Defenders, Prospectors and Analysers are about equally distributed was contradicted. Defenders outnumbered all the other strategy types in stable environments (until 1987-92) but, in more dynamic and competitive

environments (after 1993-95), Analysers came to predominate. The research findings corroborated the research of Snow and Hrebiniak (1980), who found that Defenders, Prospectors and Analysers were not equally distributed. In their study of the plastic, semiconductor and automotive industries, they found that there were more Defenders and Prospectors than Analysers. But in the air transportation industry (which was highly legislated, with competition being dictated by government rules), Reactors outnumbered all the strategy types. This indicates that the mix of strategic types in a sector is context-dependent, and a reflection of how particular sectors are structured.

In the mould sector, there was a clear discontinuity in the pattern of dominance between the 1987-92 and 1993-95 time periods, when the dominant type changed from Defenders to Analysers. This change corresponded to significant environmental changes: an international economic crisis, variation in Escudo: Dollar exchange rates, technological developments, increased and more hostile competition and customer demand. This latter point reveals that firms had to adjust their strategic positions to respond to changed economic circumstances, with the stance of Defender becoming less of a viable option in an environment that was more dynamic.

A significant contribution of this study is that under dynamic environmental conditions Portuguese mould makers prefer a moderate strategy type (Analysers), which is a strategy type that is a combination of the Defender and the Prospector strategy types; it is one that is not so defensive as Defenders nor so risk-taking as Prospectors, but a mixed strategy that deals with and combines the two extremes of stability (Defenders) and risk taking (Prospectors). This - the Analyser - is a stance that fits both stable and dynamic settings.

The stability in the number of Prospectors is an interesting finding. These companies are considered to be market development and technology adoption leaders. It would appear that this stance tends to be more strongly established in firms, which appear to have adopted and maintained this stance, irrespective of the changed economic environment.

Having determined that Miles and Snow's strategy types are applicable to the Portuguese mould industry, the next aim was to ascertain whether there are measurable and significant behavioural and other differences between the four types of firms. Consequently, the following hypothesis was tested:

H1.2. Different Miles and Snow's strategy types will reveal different business profiles that are consistent with the typology (i.e. firms that are categorised as one of these types will exhibit the patterns of behaviour expected from the literature).

According to Miles and Snow (1978:29), the four types of business have quite different patterns of behaviour. These differences were outlined in the literature review chapter. Essentially, within the Portuguese mould sector we can expect different types of firms to be making moulds of different sizes and different levels of complexity; to be operating in differing geographical and sectoral markets; to offer different services-product enlargement, to have different marketing, investments, technological profiles, organisational size, training, organisational management, customers, competition, subcontracting and organisational environment policies.

Defenders have narrow product-market domains and they do not tend to search outside of their domains for new opportunities. Prospectors continuously seek new market opportunities, and they experiment with different responses to emerging environmental trends. Analysers operate in two types of product-market domains, one relatively stable, the other changing. In their stable areas, they operate routinely and efficiently; in their more turbulent areas, they watch their competitors closely for new ideas, and then rapidly adopt those, which appear to be the most promising. Reactors are organisations in which top mangers perceive change and uncertainty occurring in their environments, but are unable to respond effectively.

It is, therefore, expected that Defenders will be relatively unchanging; they tend to persist with the capacity and complexity of the mould they manufacture, and they remain in existing geographical and sectoral markets. They tend to offer a more limited range of products or services than their counterparts, and they try to protect their domain by offering higher quality, superior services and lower prices to their customers. They are less marketing-orientated than Prospectors. As they tend not to search outside

of their domains for new opportunities, they will deal mainly with intermediaries. Their areas of investment will be concentrated on technology and infrastructures. They will continuously invest in their core technology, and they will be likely to be more technologically cost-efficient. Defenders are efficient firms, so it is expected that they will be large firms. Defenders have a tendency towards functional structure, with extensive division of labour and a high degree of formalisation, centralised control and vertical information systems. As a result, it is expected that Defenders will emphasise centralisation, organisational structure, strategic management, strategic planning and strategy implementation as strengths. As they emphasise quality, it is also expected that they will perceive quality certification as a strength. As Defenders do not tend to prospect, they will identify competition mainly in the national market.

Prospectors grow through product-market development. Prospectors are the creators of change and uncertainty by developing product and market innovation. They "can respond to the demand of tomorrow's world" (Miles and Snow: 67). Thus, it is expected that Prospectors will continuously seek product-market opportunities. They will tend to change the capacity and complexity of the manufactured mould, their geographical and their sectoral markets. They operate within a broad product-market domain that undergoes periodic redefinition. Prospectors will therefore place great emphasis on providing services alongside the mould (i.e. product augmentation). Prospectors will strongly emphasise marketing policy. They value being "first in" to new products and market areas, even if not all of these areas prove to be highly profitable. They respond rapidly to early signals indicating new business. It is therefore expected that their areas of investment will be focused on Research & Development, marketing, customer relationships and workforce development and training. Prospectors are likely to use a greater variety of technologies. As they respond quickly to the environment, they need to be flexible; they are therefore expected to be small firms focused on specific niches. They will have younger and more qualified staff than Defenders. They will strongly emphasise training policy. Prospectors are likely to perceive decentralisation, the simultaneous engineer process and innovation as their management strengths. As they are continuously prospecting, it is expected that they will have new as well as long-term customers. They will also be more aware of competition, which they will perceive as being located everywhere and they identify the Eastern European countries as a threat.

Are there differences by strategy type in the size of moulds manufactured?

The mould makers were asked to specify the capacity of complete moulds in kilos for each of the five periods (1980-86, 1987-92, 1993-95, 1996 and a forecast for 1997). The analysis reveals (Table 7) that in aggregate firms moved away from low and medium capacity to large and very large capacity moulds. In 1980-86, 30.6% of firms were manufacturing low capacity moulds (up to 1,999kgs). In 1997, this percentage dropped to 14.5%. Low capacity moulds do not offer any kind of differentiation basis and, as financial barriers to entry are low here, foreign competition is intense for low capacity and low complexity moulds. In 1980-86, 36.7% of firms were manufacturing medium capacity moulds (2,000 to 4,999 Kgs) but by 1997 this had fallen to 27.4%. At the same time as firms were switching from low to medium capacity, they were increasing their manufacturing capacity. In 1980-86, 18.4% of firms were producing large moulds (5,000 to 9,000 Kgs) but by 1997 this had increased to 25.8%. The percentage of firms producing very large moulds (over 10,000 Kgs.) more than doubled from 1980-86 to 1997 (from 14.3% to 32.3%).

The analysis also reveals that there were significant differences between strategy types and the capacity of the manufactured mould (see Figure 29). Defenders manufactured mainly medium capacity moulds (2,000-4,999 Kgs.); they produced more medium capacity moulds than any other strategic group, and they maintained that position for each time period (see Figure 29B). Prospectors and Analysers changed the capacity of the manufactured moulds. Prospectors changed from large (5,000-9,999Kgs) to very large moulds (over 10,000Kgs. - see Figures 29C, D) and Analysers from low (up to 1,999 Kgs.) to large capacity moulds (5,000-9,999Kgs - see Figures 29A, C). Prospectors were the strategic type that scored more highly on both large (in 1980-86 and in 1987-92) and very large moulds (from 1993-95 onwards).

It is interesting to note that Analysers moved from focusing on the lowest capacity category to almost the highest (large moulds), skipping the medium moulds capacity. While the percentage of Analysers that make very large moulds is lower than that of Prospectors, it increased in 1996 and 1997 to a position nearer to Prospectors (Figure

29D). There would also appear to be a lag effect in Analysers' strategic behaviour: between 1980-86 and 1987-92, Prospectors were producing large moulds, but in the subsequent period (1993-95) Analysers achieved the highest value in the production of large moulds. In 1993-1995, Prospectors decided to move way from large to very large moulds. In the following period (1996 and 1997) Analysers followed Prospectors and considerably increased their manufactured mould capacity (see Figure 29D). In 1980-87, Analysers were the strategic type that scored more highly on very large moulds (though this declined by 1987-92). It is only when Prospectors decided to substantially increase their capacity from large to very large manufactured moulds that Analysers decided in subsequent periods to produce larger moulds. Analysers thus tended to follow the strategic behaviour of Prospectors by moving up-scale in the size of moulds manufactured. This behaviour is to be expected, according to the literature, as Analysers are assumed to watch the movements of Prospectors. When the latter's strategic behaviour succeeds, Analysers tend to follow suit promptly (for further details see appendix 5A).

In discussion with managers it was discovered that Defenders, contrary to the theory, were mainly small firms and, as such they have difficulty in raising the capital to invest in technology to produce large/very large moulds. This technology is very expensive. For example, EDM equipment to craft a mould of 20,000 Kgs may cost £1 million and that technology by itself does only one of the tasks in the manufacturing process. Therefore, financial barriers may constrain the acquisition of the necessary technology to manufacture large/very large moulds. As a result, Defenders concentrate production on the capacity that they can afford (medium), though they also avoid low capacity mould production; this is an area where competition is strongest, due to the low barriers to entry.

Table 7 - Cross-tabulation, strategy types and mould capacity, 1980-97

Strategy Types 86 * Capacity 86r Cross-tabulation % within Strategy Types 86

	Capacity 86r - Kgs.				
Strategy Types 86	Up to 1999	2000-4999	5000-9999	Over 10,000	Number of Firms
Defender	23.8 %	42.9 %	23.8 %	9.5 %	21
Prospector	9.1 %	36.4 %	36.4%	18.2 %	11
Analyser	53.8 %	23.1 %		23.1 %	13
Reactor	50.0 %	50.0 %			4
Total	30.6 %	36.7 %	18.4 %	14.3 %	49

Strategy Types 92 * Capacity 92r Cross-tabulation % within Strategy Types 92

	Capacity 92r - Kgs.				
Strategy Types 92	Up to 1999	2000-4999	5000-9999	Over 10,000	Number of Firms
Defender	24.0 %	44.0 %	20.0 %	12.0 %	25
Prospector	21.4 %	28.6 %	35.7 %	14.3 %	14
Analyser	33.3 %	38.9 %	11.1 %	16.7 %	18
Reactor	33.3 %	66.7 %			3
Total	26.7 %	40.0 %	20.0 %	13.3%	60

Strategy Types 95 * Capacity 95r Cross-tabulation % within Strategy Types 95

	Capacity 95r - Kgs.				
Strategy Types 95	Up to 1999	2000-4999	5000-9999	Over 10,000	Number of Firms
Defender	14.3 %	47.6 %	23.8 %	14.3 %	21
Prospector	7.1%	35.7 %	7.1 %	50.0 %	14
Analyser	25.0 %	20.8 %	37.5 %	16.7 %	24
Reactor		25.0 %	50.0 %	25.0 %	4
Total	15.9 %	33.3 %	27.0 %	23.8 %	63

Strategy Types 96 * Capacity 96r Cross-tabulation % within Strategy Types 96

	Capacity 96r - Kgs.				
Strategy Types 96	Up to 1999	2000-4999	5000-9999	Over 10,000	Number of Firms
Defender	16.7 %	44.4 %	27.8 %	11.1 %	18
Prospector	12.5 %	18.8 %	25.0 %	43.8 %	16
Analyser	15.4 %	23.1 %	30.8 %	30.8 %	26
Reactor		66.7 %	33.3 %		3
Total	14.3 %	30.2 %	28.6 %	27.0 %	63

Strategy Types 97 * Capacity 97r Cross-tabulation % within Strategy Types 97

	Capacity 97r - Kgs.				
Strategy Types 97	Up to 1999	2000-4999	5000-9999	Over 10,000	Number of Firms
Defender	17.6 %	41.2 %	29.4 %	11.8 %	17
Prospector	14.3 %	21.4 %	14.3 %	50.0 %	14
Analyser	13.8 %	20.7 %	27.6 %	37.9 %	29
Reactor		50.0 %	50.0 %		2
Total	14.5 %	27.4 %	25.8 %	32.3 %	62

Prospectors produced large/very large moulds throughout the period of study. In interviews with managers, it became evident that Prospectors saw themselves as

"trailblazer" firms that are willing to take risks. They are generally large firms, so they can afford that risk. Having decided to manufacture large moulds from the beginning has meant that these firms have had to acquire expensive technologies, have had to invest in workforce development and have specialised in making the types of moulds that other firms find it difficult to emulate. Prospectors tend to operate in those market niches where there are stronger barriers to entry.

The findings of the research on the capacity of the manufactured mould are consistent with the theory and the expectations derived from the literature review: Defenders remained almost constant in terms of the capacity of the manufactured mould, while Prospectors and Analysers changed capacity. Defenders showed a similar pattern throughout the various timescales; they continued manufacturing medium capacity moulds. Prospectors changed from large to very large moulds, and Analysers changed from low to large capacity moulds. Reactors, as expected, did not display a consistent pattern. It is also interesting to note that Analysers tended to follow the strategic behaviour of Prospectors by moving up-scale in the size of moulds manufactured. There would appear to be a lag effect in Analysers' strategic behaviour. Generally, the findings support Miles and Snow's (1978) expectations.

The findings also show that Prospectors and Analysers changed their capacity in an attempt to adjust to the significant environmental changes that were occurring over the period, and to maintain their strategic fit with their environment. There were no significant differences in 1996 and 1997, which seems to indicate that firms made their changes and regained the stability required for business development. Having analysed the changing capacity of the moulds being produced, our attention now turns to exploring how the complexity of the manufactured mould changed, both for firms as a whole and for firms of different strategy types.

Figure 29 - Cross-tabulation, strategy types and the capacity of the manufactured mould; the evolution within capacity category, 1980-97

Figure 29A - Small mould capacity, up to 1.999, 1980-97

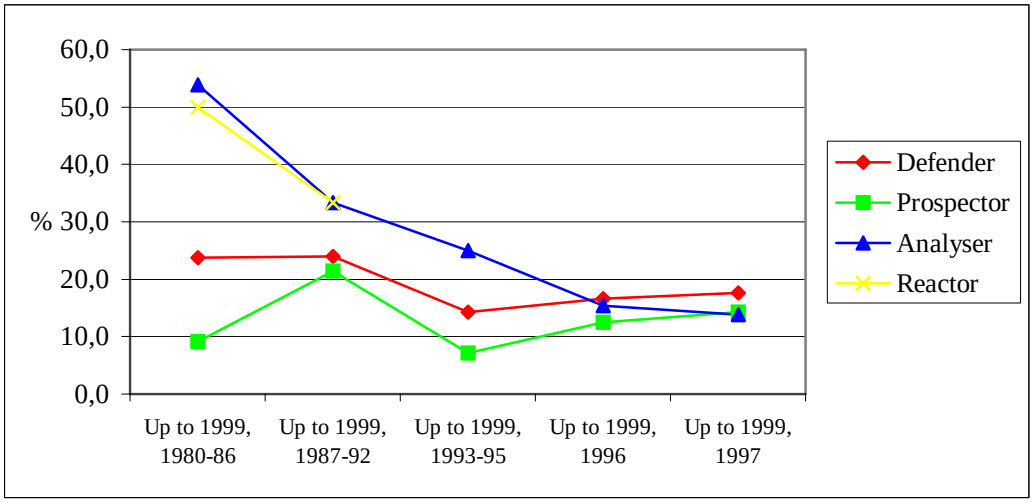


Figure 29B - Medium mould capacity, 2.000-4.999, 1980-97

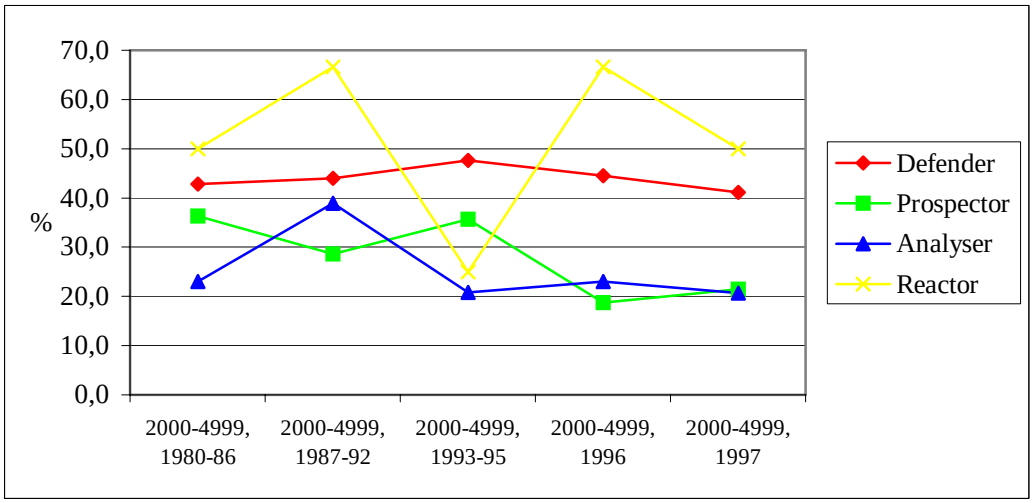


Figure 29C - Large mould capacity, 5.000-9.999, 1980-97

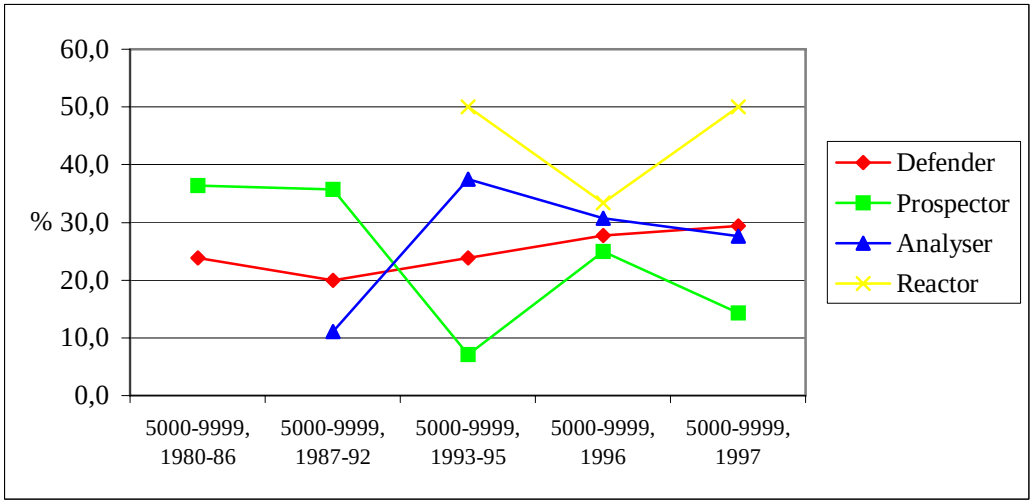
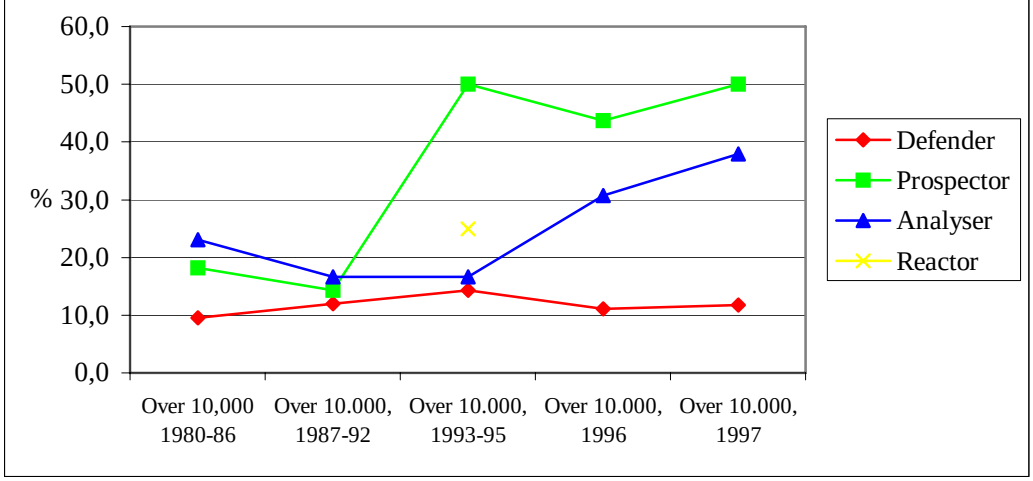


Figure 29 Cont. - Cross-tabulation, strategy types and the capacity of the manufactured mould; the evolution within capacity category, 1980-97

Figure 29D - Very large mould capacity, over 10.000, 1980-97



Are there differences by strategy type in the complexity of manufactured moulds?

Managers were asked to specify the complexity (categorised a low, medium or high) of the moulds that they were manufacturing for the five time periods. In general, the analysis reveals (Table 8) that firms moved away from low complexity to medium and high complexity moulds. In 1980-86, 65.3% of firms were manufacturing low complexity moulds, but by 1997 this had decreased to 25.4%. Conversely, in 1980-86, 20.4% of firms were producing medium complexity moulds, but by 1997 this had more than doubled to reach 47.6%. In 1980-86, 14.3% of firms were manufacturing high complexity moulds, but by 1997 the number of firms manufacturing high complexity moulds had almost doubled to stand at 27%.

The results show that Defenders, Prospectors and Analysers were manufacturing mainly low complexity moulds in the period 1980-86 (Figure 30A). In this period, competition was relatively mild and firms could exist by producing low complexity moulds. However, as the competitive environment changed and new producers in low cost economies began to capture the low complexity end of the market, Portuguese firms (who could not compete on price) had to react. Their prime reaction was to increase mould complexity, (which was only possible due to their long-term experience and

knowledge in manufacturing moulds). This ensured that barriers to entry became more pronounced for competitors, so they were able to defend their competitive position against low cost producers in the Far East.

Defenders moved from low to mainly medium complexity moulds, and they maintained that position for all time periods (Figure 30B). In interviews with managers it was discovered that Defenders tend to establish long-term relationships with their customers. Consequently, as they tend to serve the same customers for long periods, the level of product development and innovation is low. They are content to service the same customer base with the same product at the same complexity level for long periods of time.

Prospectors moved away from low to primarily medium and high complexity moulds (Figure 30B and C) and continuously decreased the percentage of low complexity moulds (see Figure 30A): in 1997, Prospectors produced the lowest percentage of low complexity moulds (14.3%) and this had already declined significantly from 1980-89 (63.6%). Prospectors are the highest proportion of firms specialising in high complexity moulds (Figure 30C).

Analysers are seen to have had a similar trajectory to Prospectors: they moved away from low to mainly medium and high complexity moulds (Figure 30). In 1980-86, 69.2 % of Analysers were manufacturing low complexity moulds, but by 1997 the percentage had fallen to 20.7%. Conversely, in 1980-86, 7.7% of Analysers were manufacturing medium complexity moulds, but by 1997 this had increased sevenfold to 51.7%. In 1980-86, 23.1% of Analysers were manufacturing high complexity moulds, but by 1997 this had increased to 27.6%. Once again, Analyser behaviour seems to lag Prospector behaviour: as Prospectors move into the production of more complex moulds in one time period, Analysers tend to follow them in subsequent periods. In 1993-1995, 57.1% of Prospectors were producing medium complexity moulds but in subsequent periods (1996, 1997) Analysers surpassed them (Figure 30B).

Table 8 - Cross-tabulation, strategy types and mould complexity, 1980-97

Strategy Types 86 * Mould Complexity 86 Cross-tabulation % within Strategy Types 86

	Mould complexity 86			
Strategy Types 86	Low	Medium	High	Number of Firms
Defender	61.9 %	38.1 %		21
Prospector	63.6 %	9.1 %	27.3 %	11
Analyser	69.2 %	7.7 %	23.1 %	13
Reactor	75.0 %		25.0 %	4
Total	65.3 %	20.4 %	14.3 %	49

Strategy Types 92 * Mould Complexity 92 Cross-tabulation % within Strategy Types 92

	Mould complexity 92			
Strategy Types 92	Low	Medium	High	Number of Firms
Defender	40.0 %	48.0 %	12.0 %	25
Prospector	35.7 %	28.6 %	35.7 %	14
Analyser	38.9 %	27.8 %	33.3 %	18
Reactor	66.7 %	33.3 %		3
Total	40.0 %	36.7 %	23.3 %	60

Strategy Types 95 * Mould Complexity 95 Cross-tabulation % within Strategy Types 95

	Mould complexity 95			
Strategy Types 95	Low	Medium	High	Number of Firms
Defender	23.8 %	52.4 %	23.8 %	21
Prospector	14.3 %	57.1 %	28.6 %	14
Analyser	37.5 %	33.3 %	29.2 %	24
Reactor	75.0 %	25.0 %		4
Total	30.2 %	44.4 %	25.4 %	63

Strategy Types 96 * Mould Complexity 96 Cross-tabulation % within Strategy Types 96

	Mould complexity 96			
Strategy Types 96	Low	Medium	High	Number of Firms
Defender	27.8 %	44.4 %	27.8 %	18
Prospector	18.8 %	43.8 %	37.5 %	16
Analyser	23.1%	53.8 %	23.1 %	26
Reactor	66.7 %	33.3 %		3
Total	25.4 %	47.6 %	27.0 %	63

Strategy Types 97 * Capacity 97r Cross-tabulation % within Strategy Types 97

	Mould complexity 97			
Strategy Types 97	Low	Medium	High	Number of Firms
Defender	35.3 %	41.2 %	23.5 %	17
Prospector	14.3 %	50.0 %	35.7 %	14
Analyser	20.7 %	51.7 %	27.6 %	29
Reactor	66.7 %	33.3 %		3
Total	25.4 %	47.6 %	27.0 %	63

An interesting point to emerge here is that while Prospectors and Defenders have strategies that are independent of each other, this research on the Portuguese mould industry identified a tentative assertion that there is a linkage between the strategies of

Prospectors and Analysers: where Prospectors lead, Analysers tend to follow. Given the intention to use this analysis as an input to the formulation of regional policy, this is an important finding as policy geared to influencing the behaviour of leading edge Prospector companies can be expected to have a trickle-down effect on Analyser companies and be influenced by and learn from Prospectors.

Reactors tended to produce low complexity moulds in all time periods (Figure 30A). As suggested by the literature, they do not appear to have a consistent product-market orientation. They exist in a market segment, which has low barriers to entry.

In discussion with a manager in a Prospector company, the reasons why Prospectors changed the capacity and complexity of the moulds they make became evident. The manager concerned said:

> "In the 80s the mould industry was booming worldwide, and that was giving the opportunity to a significant number of firms to get into the business. After rosy times, come the thorns. In the early 90s, as a result of an international economic crisis, firms started to get into economic difficulties. There was a shortage of customer' orders, the machines were working at half of their technological capacity; employees were just hanging around, and the bills were piling up on my desk. Also, we, like other firms, had made major investments in technology, so there was that to pay as well. We were for the first time feeling competition like never before - from Italy and from the Far East Asian countries, which most of us used to joke and say, that it was nothing to worry about, as they still needed to improve a lot to reach our levels of quality. Unfortunately for us, they were learning quickly how to do quality standard moulds. So there was an urgent need to do something if we did not want to be history. We saw that by manufacturing large/very large capacity moulds and medium to high complexity moulds, we could play to what, in fact, is still our competitive advantage - our long term experience and know-how. And by doing so, we could create a differentiation basis and avoid competition. So we decided to make investments in technology in order to increase our manufactured mould capacity and complexity".

From this and other discussions with Prospectors, it became clear that they always intuitively seemed to know where to go and what to do and somehow they always seemed to get it right. This may be because managers in this type of company tend to travel abroad more in their search for customers and, consequently, they share

experiences with other overseas mould makers and learn from them - or perhaps they are more effective at understanding their customers' early signals.

The analysis also reveals that, as with changing mould capacity, most of the changes with the mould complexity happened between 1987-92 and 1993-95. This point seems to indicate a hiatus in the strategies of firms, due to radical changes that were occurring in their economic environment. It seems that Prospectors and Analysers were most likely to change their strategic behaviour at this point, while most Defenders were reluctant to do so, as they continued to concentrate their production on medium complexity moulds. Again, this can be explained by the more inert relationship between Defenders and their customer base, and Prospectors and Analysers and their customer bases. Clearly, a more dynamic relationship between producers and their customers seems to make firms more flexible and innovative.

The findings for the complexity of the manufactured mould show that, as suggested by the theory, Defenders tend to maintain their market domain and Prospectors and Analysers tend to change it (for further details see also appendix 5B). Defenders have mainly concentrated their production on medium complexity moulds. Prospectors and Analysers have shown a similar pattern. They have changed the complexity of their manufactured moulds; they have moved away from low, to mainly medium and high complexity moulds. Reactors have maintained their mould production mainly on low complexity. Once again we can see the lag effect in the strategic behaviour of Analysers. When Prospectors decided to increase the complexity of their manufactured mould, Analysers tended to follow them in the subsequent period. The change of the complexity of the manufactured mould occurred in 1987-92 and 1993-95, which corresponded to significant environmental changes. It seems to have been the response of firms to adjust to the undergoing environmental changes. The current results are consistent with the theory. Support was found for Miles and Snow.

Figure 30 - Cross-tabulation, strategy types and the complexity of the manufactured mould; the evolution within complexity category, 1980-97

Figure 30A - Low mould complexity, 1980-97

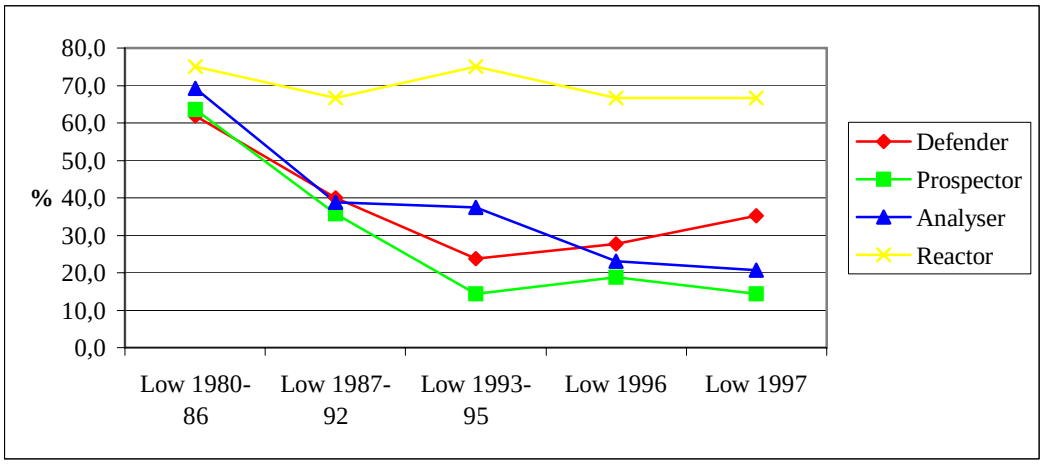


Figure 30B - Medium mould complexity, 1980-97

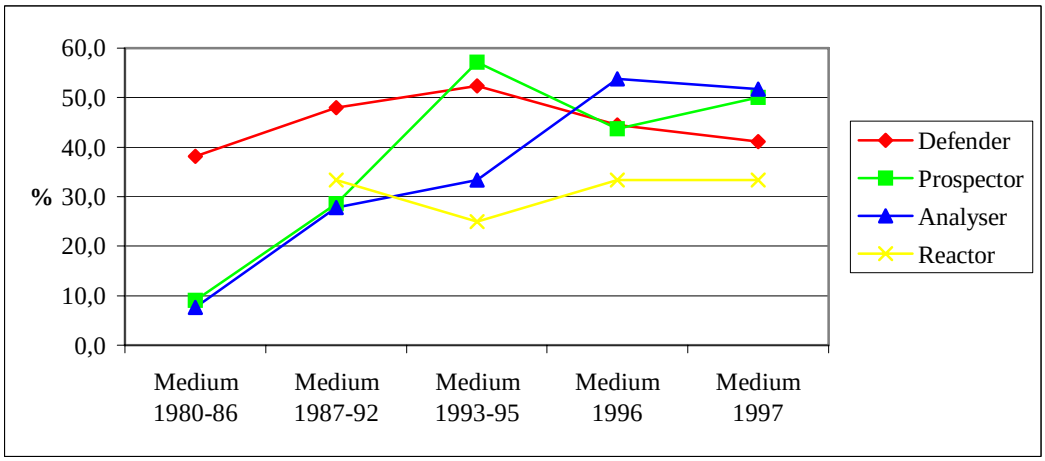
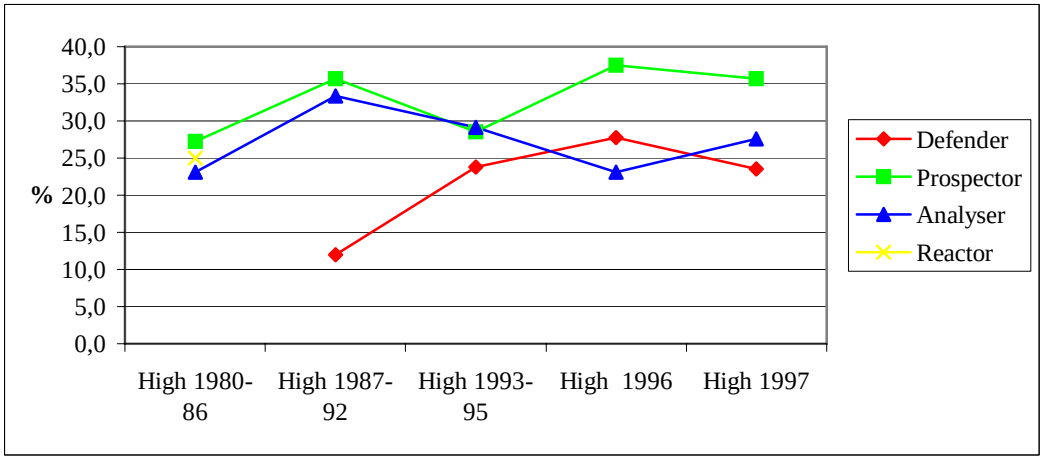


Figure 30C - High mould complexity, 1980-97

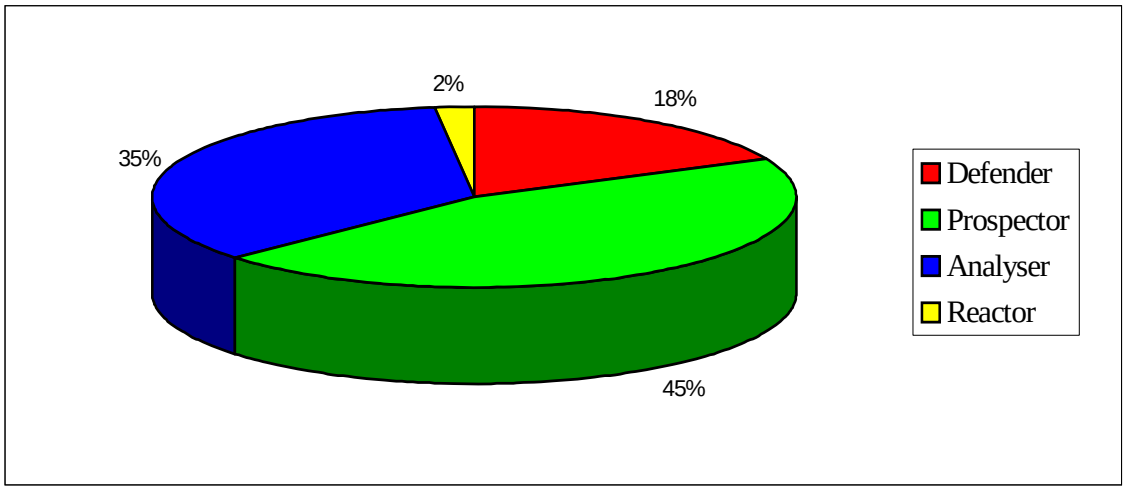


Are there differences by strategy types in the geographical pattern of sales in 1996?

The respondents were asked to identify the percentage of total sales to different geographical markets over the five time periods. However, to provide a context for analysis, the percentage of total sales for each strategy type in 1996 is shown below. In 1996, Prospectors had the highest percentage of total sales at 45% followed by Analysers, Defenders and Reactors at 35%, 18% and 2% respectively (see Figure 31). The literature reviewed does not suggest any hierarchy of strategy types in terms of the volume of total sales. But, given that high risk is often rewarded by high returns, it might not be surprising that Prospectors account for a high volume of sales, despite being the second smallest group of firms (the smallest group is Reactors).

Additionally, while Analysers were the numerically dominant strategic type, Prospectors have been shown to be the producers of large/very large capacity moulds and more highly complex moulds, which are much more expensive than large/medium to small moulds. For instance, a car dashboard is 3 or 4 times more expensive than a small and complex mould for a car connector.

Figure 31 - Frequencies, strategy types and the percentage of total sales, 1996



In 1996 (see Figure 32, and appendix 5C), Prospectors were mainly selling (in terms of the volume of total sales) to the Swedish, American, Portuguese, and French markets. The French market was followed by the German, Dutch, “Other”, Brazilian and British markets. To the Swedish market Prospectors serve customers like Volvo, SAAB,

Electrolux, and Ikea. To America, they sell to clients such as General Motors, Thomson, Motorola, Xerox, Whirlpool, and Coca-Cola (handling boxes). The Portuguese market ranked third most important. Sales to the domestic market are largely through sales to intermediary firms rather than to final demand: output often forms part of a more complex product, which, in turn, might be exported. Some Prospector mould makers belong to an economic group to which intermediaries also belong. The intermediary firm orders the mould(s) from manufacturers of the group for export purposes. The French and German markets are largely associated with the automobile industry, with customers such as Renault, BMW, Audi, Mercedes Benz, and Volkswagen. The Dutch market has important customers such as Philips, in the domestic appliance sector, and Samsonite (the well-known travel goods brand) in "other" industries.

The prime market for Analysers was the domestic market (Figure 32), followed by Germany, where sales are largely to the automobile (e.g. Opel), domestic appliance (e.g. Bauknecht) and electric/electronic (e.g. Grundig) sectors. Again, many sales into the domestic market are sales not to final demand but to intermediary firms. The American market was the third most important, followed by the French, Brazilian and Spanish markets. It is important to emphasise that Analysers sold most to the German, Brazilian, Spanish and Israeli markets. Analysers' Brazilian customers are in general multinational firms that have opened plants in Brazil. In the Spanish market, Analysers serve mainly the automobile (e.g. Seat) and domestic appliance (e.g. Fagor) industries. The Spanish market has become important due to its geographical proximity. The Analysers' client industry in the Israeli market is agriculture (e.g. technical moulds).

Defenders were selling primarily to the American, Portuguese, German, "Other" and British markets. It was expected that the American market would be the most important market for Defenders. Defenders are known to have longstanding relationships with their customers, and this is reflected by their persistence in the American market (from the very beginnings of the history of the Portuguese mould industry, the American market has been the most important). Prospectors have a high volume of sales in the American market (higher than Defenders), because they sell larger moulds, which are much more expensive than medium moulds. Defenders serve mainly the domestic

appliance, the domestic utilities, medical/pharmaceutical (especially due to cuts in the American Health system) and toy industries in the USA.

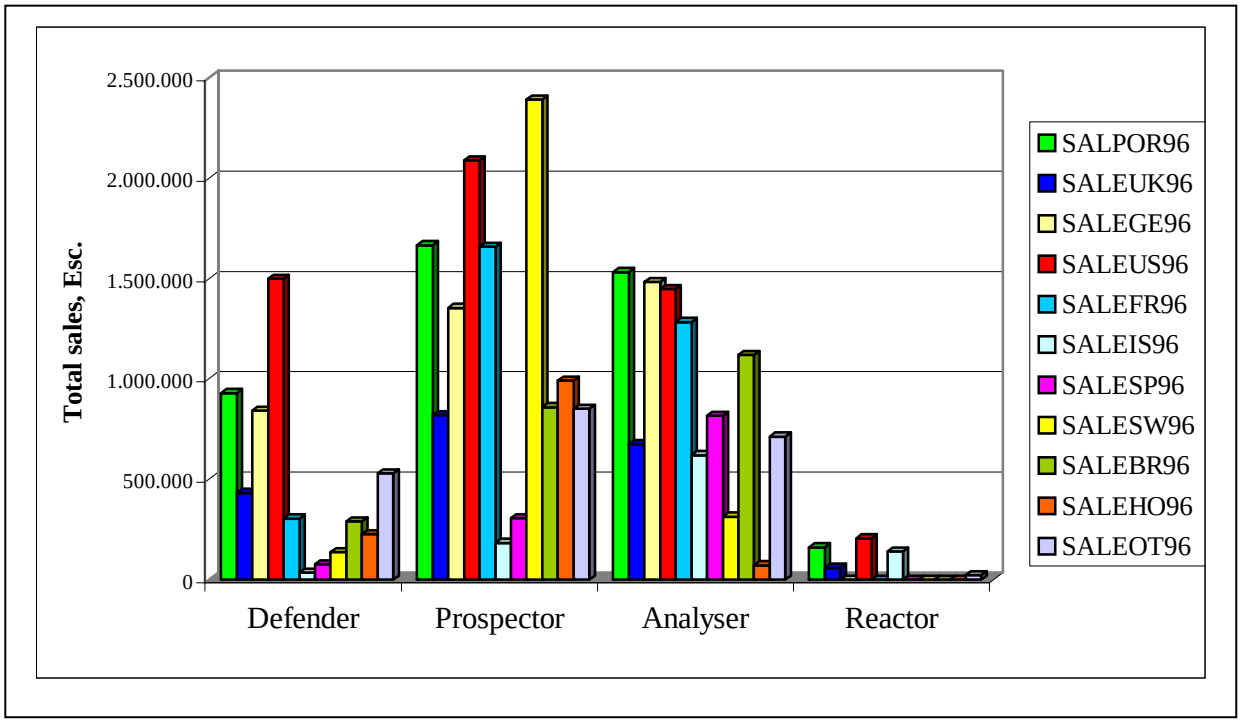
According to a Defender manager, the American market buys “commercial” moulds (consumer moulds) especially to cosmetic, domestic utilities, electric/electronic and medical industries and the European market buy “technical/industrial” moulds (moulds that are interconnected, intertwined) especially to the Automobile, and domestic appliances industries.

The second most important market for Defenders was the Portuguese market, and there is a strong historical legacy here. Most of the Defender firms (that sell primarily into the domestic market) were established by employees who had left larger firms to set up their own businesses. Many of these firms are very craft-oriented, and trade on their niche technical skills: they are, and continue to be, extremely skilled and knowledgeable in specific technical tasks, but they lack management, marketing or international business knowledge, or the capacity to do business internationally. The Portuguese intermediary trade firms could therefore see an opportunity for them to deliver specific services. With little investment (an office, one or two people, and low technological investment) and good networks of contacts, they could offer niche services that mould makers could not provide. Some Defenders have become completely dependent on intermediary trade firms to sell overseas.

In conversation with mould makers it was found that some had realised that this emphasis on technical skills meant that they were undertaking the skilled tasks (with heavy investment in technology), while intermediaries were making high levels of profit. Consequently, some Defenders started to develop management skills in order to reduce their dependency on intermediaries, and thereby increase their own profitability. They have slowly started to establish contacts with potential overseas customers and to refuse orders from intermediaries. Hence a process of disintermediation appears to be taking place for Defenders, as they begin to deal with end-users direct. In addition, these Defenders have specialised their production on small high precision /technical moulds which they sell mainly into the German market (serving mainly the automobile,

electronic and aerospace industries). Reactors were selling everywhere. As expected, they did not show any consistent pattern in their target markets.

Figure 32 - Strategy types and the markets to which they currently sell (1996)



Are there differences in the way that different strategy types have switched geographical markets (significant changes)?

Figures 33A to D (for further details see also appendix 5D) reveals the extent to which the geographical pattern of sales has changed for each strategic type since 1980-96. The most significant changes have occurred in the distribution of sales across the American, German, French, and Brazilian markets. During 1980-86, all strategy types were selling mainly to the American market. In 1987-1992, firms reinforced their sales to the American market, but sales to the German market became increasingly prevalent. In 1993-95, the American market continued to lead and the German market continued to be the second most important. But a new set of markets emerged – especially the French and Brazilian. From 1996, the Swedish, Dutch, and the Israeli markets became prominent.

For Defenders, Prospectors and Analysers, the American market is hugely important, but its dominance has become less pronounced (Figures 33A to D). The American market has remained dominant for Defenders throughout the period of study, reflecting the relative inertia of Defenders and their geographical markets. Defenders have also increased their sales to the German market. In 1996, Defenders were still focused primarily on the American market, but the main markets for Prospectors were the American, Dutch, German, Brazilian, and Swedish ones, while the main markets for Analysers were the Brazilian, American, German, and Israeli ones. This analysis supports the assertion that Prospectors and Analysers have radically different behaviours from Defenders and Reactors. The one market that typifies these differences is the American market: while Analysers and Prospectors were reducing their sales to the American market, Defenders were increasing sales. As Analysers and Prospectors were reducing sales to the American market, they were developing into other markets - these were predominantly European ones (reflecting Portugal's accession to the EU) and the Brazilian market (reflecting linguistic and cultural ties between Brazil and Portugal). The analysis reveals that the markets of Prospectors and Analysers have become much more diffuse and less concentrated on one single geographical market than those of Defenders, which have a relatively inert marketing pattern. These findings are consistent with the theory and expectations derived from the literature. Defenders have on average shown a relatively stable trend, whereas Prospectors and Analysers have considerably changed their strategic pattern; over the periods, there were significant changes in the markets to which firms were selling. The current research findings confirm Miles and Snow (1978).

It is interesting to note that while Analysers follow the Prospector's behaviour regarding the capacity and the complexity of the manufactured mould, they seem to show a clear pattern of strategic behaviour in terms of choice of market. The selection of their markets is different and distinctive from Prospectors. Analysers seem to target the German, Brazilian, Israeli, Spanish and "other" markets, while Prospectors have chosen the French, Dutch, Portuguese and Swedish markets. Defenders have opted for more traditional markets (due to long-term historical relationships in the mould industry), namely the American and British markets. It seems, therefore, that each strategic type differs with regard to the market in which the most significant variation in total sales

occurred. The current research findings are consistent with the national export statistics shown in Chapter 3, illustrating that the American and European markets (the German and French markets) have switched in export leadership. Reactors increased their sales to the Portuguese market. It is suggested that firms have changed the markets to which they sell in response to major environmental shifts (i.e. in 1987-92 and in 1993-95).

In relation to 1997 (a forecast), the majority of firms (especially Prospectors) aim to increase their sales above all to the Brazilian, American, and German markets (83%, 67 % and 58%, respectively), see Table 5D3 in appendix 5D. Brazil is now a politically and economically stable country. It is undergoing rapid growth, it is a huge market, and it offers incentives to multinational firms for local investment. Additionally, there is a cultural proximity with Brazil, as a Portuguese-speaking former colony. There are therefore a set of factors that make the Brazilian market interesting for Portuguese mould makers.

The analysis of the geographical markets reveals that there is a clear hierarchy of strategy types regarding the volume of total sales. Prospectors lead sales in the Portuguese mould industry, followed by Analysers, Defenders and Reactors. However, given that high risk is often rewarded by high returns, it should not be surprising that Prospectors account for a high volume of sales, despite being the second smallest group of firms (the smallest being Reactors). These findings are significant for government and non-governmental organisation policy makers. They illustrate that the support given to firms (Analysers and Defenders) for business development should be based on the strategic behaviour of Prospectors. Analysers and Defenders should be helped to become Prospectors. For 1996, Prospectors, Analysers and Defenders had distinctly different markets. Reactors were selling everywhere; as expected, they have not shown any consistent pattern in their target markets.

Figure 33 - Strategy types, trends in geographical markets: 1980-96

Figure 33A - The geographical pattern of sales, 1980-86

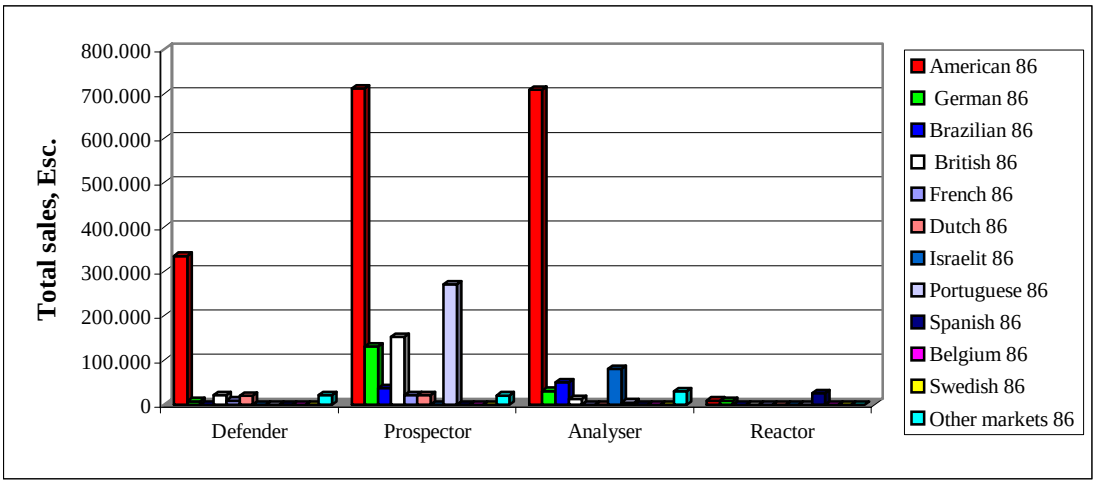


Figure 33B - The geographical pattern of sales, 1987-92

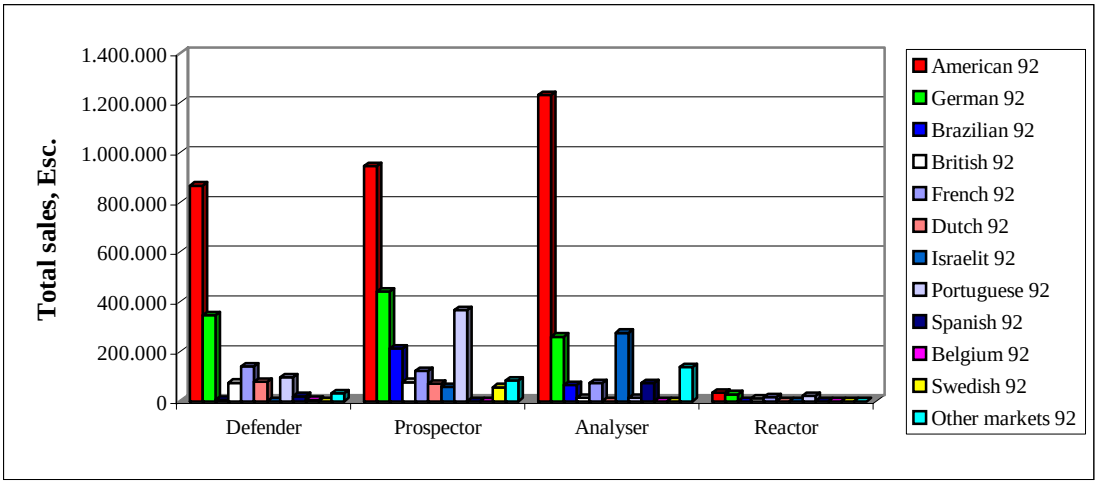


Figure 33C - The geographical pattern of sales, 1993-95

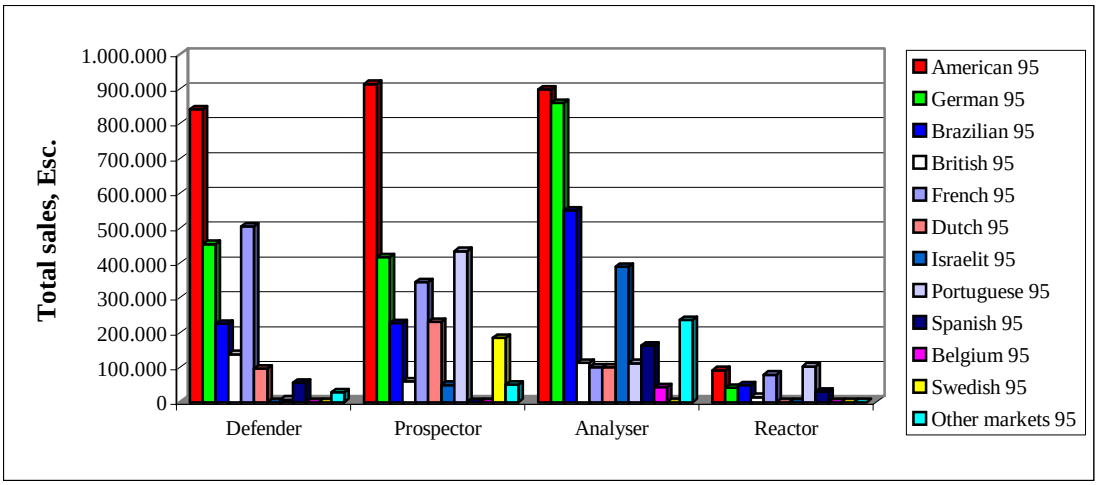
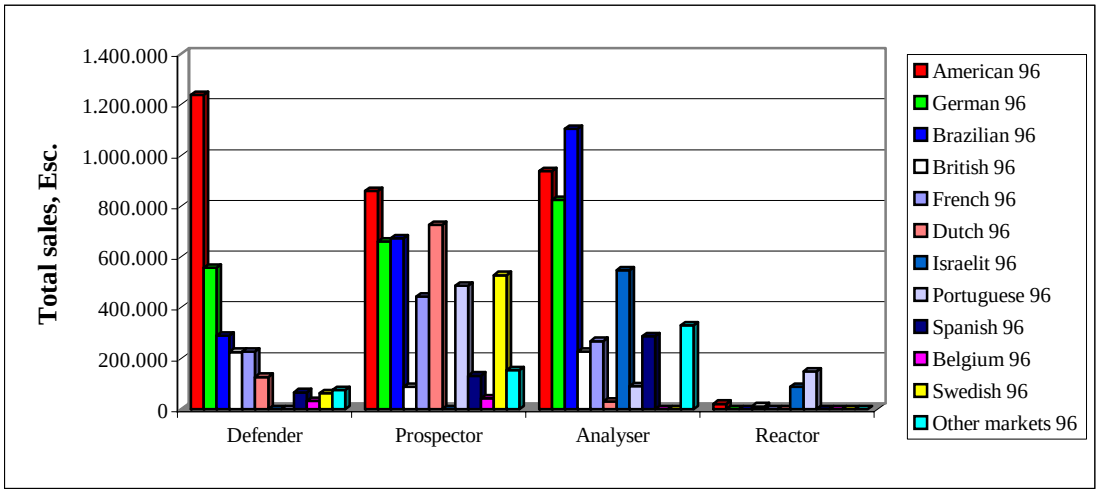


Figure 33 Cont. - Strategy types, trends in geographical markets: 1980-96

Figure 33D - The geographical pattern of sales, 1996



Over the timescales 1980-96, significant market changes occurred in the American, European and Brazilian markets. Prospectors and Analysers reduced their sales to the American market, while increasing them to the European (reflecting Portugal's accession to the EU) and Brazilian markets (reflecting linguistic and cultural ties between Brazil and Portugal). Defenders show a relatively stable trend, whereas Prospectors and Analysers have, as expected, considerably changed the markets to which they sell. The findings confirm Miles and Snow (1978). The majority of firms aim to continue to increase their sales (1997, a forecast), primarily to the Brazilian, American, and German markets. Additionally, the findings show that firms have changed the markets to which they sell, in response to major environmental shifts (i.e. in 1987-92 and in 1993-95). Having analysed the differences between strategy types and their markets, and their significant changes over time, the next objective is to identify differences in strategy types regarding sectoral markets (client industries).

Are there differences in the client industries of different types of firm?

Respondents were asked to identify what percentage of total sales had been to different client industries in the periods 1980-86, 1987-92, 1993-95, 1996 and 1997. The analysis is presented as Figure 34A to D, and it reveals that there have been radical industrial sectoral shifts in the patterns of sales. Many firms have moved out of the toy sector

(which predominated in 1980-86) into the automotive industry (which predominated in 1996). In 1980-86, the toy industry was the prime customer in terms of total sales (Figure 34A) and was followed by the domestic appliances and electric/electronic sectors. In 1987-1992, the toy industry was replaced by the domestic appliance sector as the prime market. The electric/electronic and the automotive sectors followed the domestic appliance industry. Between the 1987-92 and 1993-95 periods, there was a radical change in the profile of sales to different sectors, with sales to the automotive sector becoming increasingly strong. In 1996 the automotive sector strengthened its leadership position and was the dominant sector.

The results reveal that different strategy types have different profiles in terms of the sectors they sell into. Different types of firms tend to have different core industries, and these core industries have changed over time. In 1980-86, both Prospectors and Analysers were mainly selling into the toy sector, with Defenders focusing on the domestic appliance sector. By 1987-92, there had been a substantial change, with Prospectors and Analysers having moved out of the toy sector: while Prospectors have moved into the domestic appliance sector, Analysers have moved into the automotive sector. By the next period (1993-95), both Prospectors and Analysers had increased their level of sales to the automotive sector, with Prospectors being less exposed to the domestic appliance sector. By 1996, both Prospectors and Analysers were very heavily committed in the automotive sector, while Defenders were making most sales to the domestic utilities sector. The automotive sector is of less interest to Defenders: in discussion with a Defender firm, the proprietor cited the constant changes in the design of the mould required by the automobile customer, the delays that this caused to other customers' delivery times and the postponement of payments[1] as factors that made the

[1] In general, firms receive 1/3 of the mould production fee with the order, generally 1/3 when they send the first samples, and the other 1/3 when the mould is delivered. In most cases, the mould is complete when the samples are sent, but the mould makers have only received 2/3 of the payment from the customer. Because in the automotive sector they work with prototypes, they delay the delivery of the mould; they only want the mould when they are ready for mass production (the gap between the delivery of the samples and the delivery of the mould could be up to one year). They are therefore reluctant to pay for the final 1/3. So mould makers need to finance the other 1/3 themselves for a long period. If they are producing a significant number of moulds at the same time, they must have the financial capacity to overcome the cash flow difficulties. To increase these difficulties, when Defenders firms ask for a bank loan to finance the mould production, the banks now want personal possessions as a guarantee rather than the

sector less attractive. In addition, many automotive firms have stringent conditions that they expect suppliers to fulfil, which are beyond the managerial and organisational capacities of many Defenders (e.g. heavy compensations for each day that they delay the mould delivery - 1% discount for each day in the first week, and 10% a day in the second week). These changes are mostly caused by changes made by the automotive customer to the design of the product. Additionally, automobile customers are generally multinational firms with an enormous bargaining power, who squeeze prices at the same time as demanding high standards of quality and short delivery times. Moreover, the moulds for this industry are expensive, and firms need to have the financial capacity to back their production.

Prospectors have also most sold to the domestic appliance and "other" industry (e.g. medical, pharmaceutical, packaging, office and gardening furniture, school material, cosmetic, civil engineering: pipes for building constructing, and agriculture) and they have sustained continued and remarkable growth. It is also interesting to see that Prospectors have increased their sales to the electric/electronic industry and have been, with an exception in 1993-95 (in which Analysers led sales), the strategic group that sold the most to this sector (Figure 34). In 1996 Prospectors increased their sales to this sector, while Analysers decreased theirs.

Together with Analysers, Defenders significantly increased their sales to the domestic utilities sector becoming the most dominant strategic group in this sector in 1996 (Figure 34D). A possible explanation is that Defenders manufacture moulds of medium capacity and medium to high complexity for the domestic utilities industry (serving customers such as "Tupperware"). Defenders and Prospectors had a similar level of strategic growth in this industry.

For 1997, firms were asked to forecast sales by sector. The analysis reveals that the majority of firms expected to maintain the sales sector profile shown in the analysis of the 1996 data. However, Prospectors were forecasting higher sales to the automotive,

merchandise (the mould) as formerly. Sometimes the moulds are so expensive that it is difficult to cover them with personal properties.

electric/electronic and domestic appliance sectors. Out of those firms selling to the toy industry, 46% expected a decrease in sales.

According to the theory, Prospectors have a broad product-market domain and are continuously searching for new opportunities. Prospectors were found to be the group that most changed their strategic behaviour in relation to their client industries (the toy industry was the most important in 1980-86, the domestic appliance industry in 1987-92, and the automobile industry in 1993-95 and 1996). Defenders, as expected, maintained a relatively stable position (domestic appliances were their prime industry from 1980 to 1995) and it is only in the subsequent period (1996) that they changed their prime industry to the domestic utilities (for more details see appendix 5E). These findings conform to Miles and Snow's (1978) expectations. As in the previous analysis, the most profound industrial sectoral changes occurred between 1987-92 and in 1993-95, reflecting firms' responses to environmental changes.

To summarise, the findings show that the moulding sector changed the industrial sectors to which it sells quite radically over the period of study. Different types of firms changed their sectoral markets in different ways; firms of different strategic type have had different core client industries and their relationships have differed. Broadly speaking, the findings concur with what would be expected from the literature review. Most firms moved out of the toy sector (with its focus on small, low complexity moulds which producers in emerging economies can manufacture at much lower cost) to the automotive sector. There has been a migration of Prospectors and Analysers from the toy industry to primarily the automotive and the domestic appliance industries. Defenders mainly targeted the domestic utilities. The analysis shows that (with the exception of the domestic utilities to which Defenders sell more), Prospectors sell most to various industrial sectors (e.g. automotive, electric/electronic, domestic appliances, and "other"), showing a clear hierarchy in the strategic types. Analysers and Defenders followed Prospectors. These findings are relevant for policy-makers since they show which industries should be supported for business development and those that should be avoided because they do not offer competitive advantages.

Figure 34 - Strategy types and the client industries, 1980-96

Figure 34A - The client industries, 1980-86

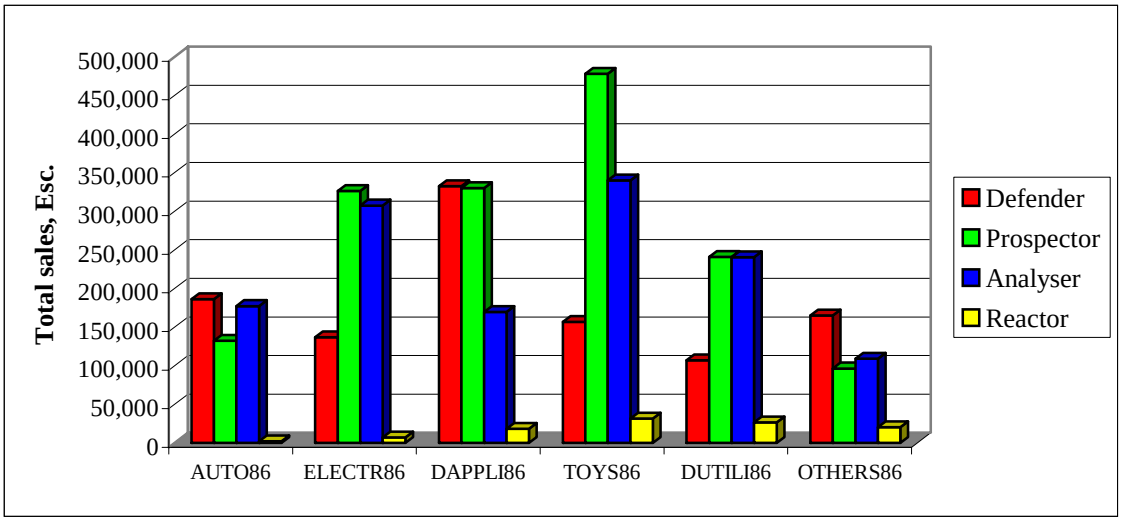


Figure 34B - The client industries, 1987-92

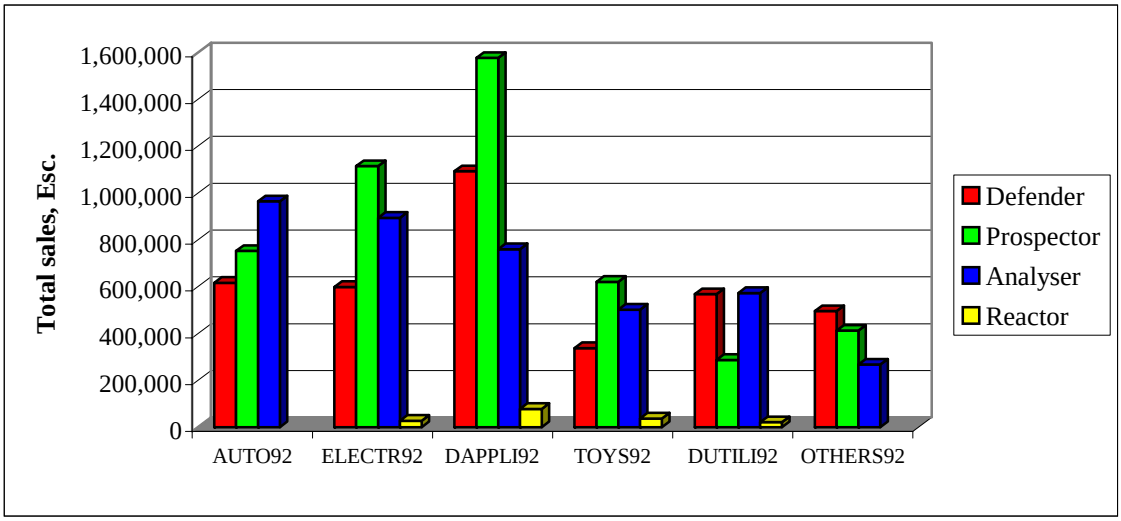


Figure 34C - The client industries, 1993-95

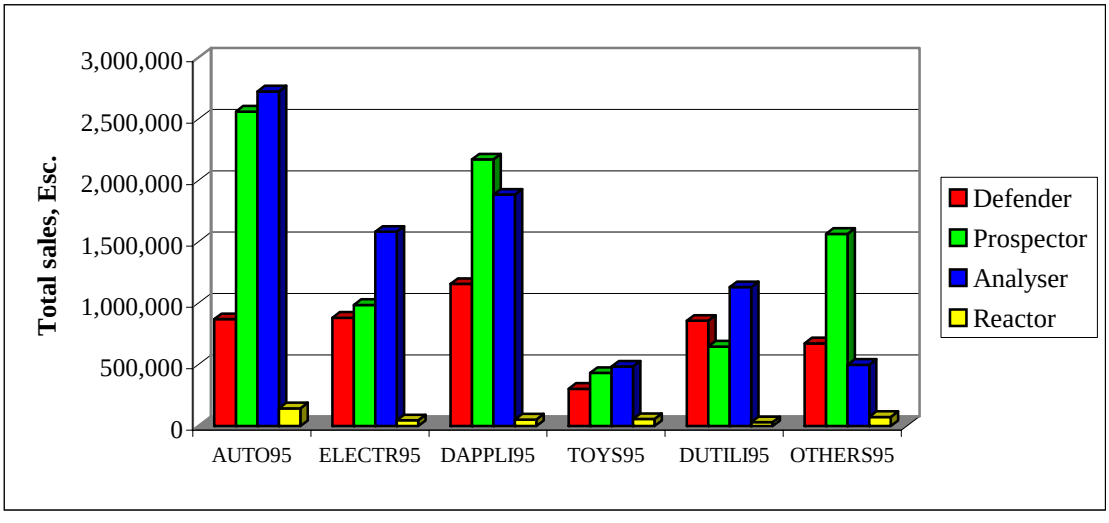
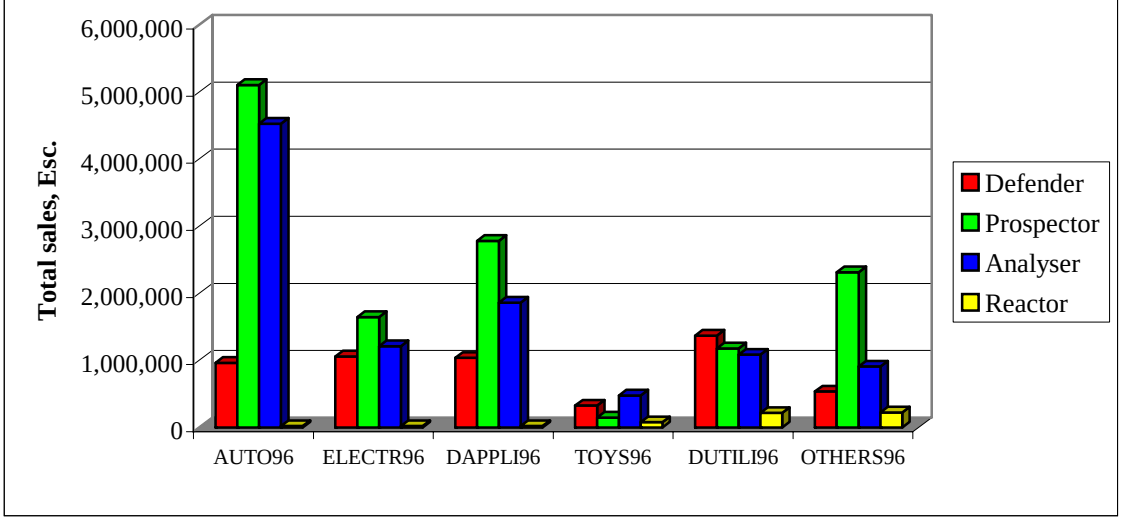


Figure 34 Cont. - Strategy types and the client industries, 1980-96

Figure 34D - The client industries, 1996



The profile of sales to industrial sectors changed quite radically between the 1987-92 and the 1993-95 time periods and these changes reflected the impact of significant environmental changes on firms. As expected, Defenders have been most stable in terms of their profile of sales to industrial sectors and this reflects their relative inertia driven by their attempt to develop long term relationships with customers in stable markets. According to the theory, Prospectors have a broad product-market domain and are continuously search for new opportunities. Also as expected, Prospectors have changed most considerably the industries into which they were selling: they vacated the toy sector and now sell primarily to the automotive and domestic appliance sector - both of which are mainly multinational firms, i.e. very demanding clients.

Support was found for Miles and Snow's Prospector marketing element. Prospectors were strongly marketing orientated, exploring new product developments and new market opportunities. As suggested by the theory, they value being the "first in" to new product and market areas: Snow and Hrebiniak (1980) concluded that Prospectors emphasised marketing competences. McDaniel and Kolari's (1987) findings showed that Defenders were organisations consistently lacking in marketing orientation as they primarily concentrated their attention on the current products and markets. Conversely,

Prospectors were strongly marketing-orientated, exploring new product developments and new market opportunities. Analysers fitted in between; they adopted either the Defender or Prospector strategic marketing emphasis. Conant et al's (1990) results demonstrated that Prospectors presented superior marketing competences (in exploring new product and market opportunities) compared to other strategy types. Defenders had relatively weak marketing competences, as did Reactors. Salter and Narver (1993), in relation to the marketing element, concluded that Prospectors were positively associated with strong market orientation-new product developments. Analysers also had significant market orientation. The current research results support Miles and Snow (1978), Snow and Hrebiniak (1980), McDaniel and Kolari (1987), Conant et al (1990) and Salter and Narver's (1993) findings. Having analysed the differences between strategy types and their client industries, the next aim is to identify differences between strategy types and service-product augmentation.

Are there differences in service-product augmentation of different strategy types?

Respondents were asked to identify which phases of the production process they wanted to concentrate on (1996). The analysis shows that (Figure 35) Prospectors have given most emphasis to all phases of the production process, with significant differences in Product definition-product design and product definition-prototyping (Tables 9 and 10). Prospectors were more likely to offer more diversified services (i.e. product definition-product design, product definition-prototyping, mould design, CAD/CAM/CAE, mould base, mould try-out, production of plastic pieces and marketing that were not part of their core business) than Defenders. It seems that Prospectors emphasise vertical integration, either upstream or downstream, on the value chain. One Prospector manager stated that it is the enlargement of the phases of the production-service process (i.e. the offer of a variety of services alongside the manufactured mould) that gives firms the competitive edge and customers added value. He said:

> " There is too much competition on the manufacture of the mould; firms do it quite well. Therefore, there was a need to offer to customers something different. We understood that if we could offer simultaneous engineering *(also called concurrent engineering involving product definition, product design and product definition-prototyping)* as well as the production of the plastic pieces, we could reduce the mould delivery time (by improving communication as well as

> minimising mould design mistakes) at the same time as offering a complete service to customers, leaving them with a basis less open to competition and less sensitive to price. As the product life cycle is shortening, we understood that there was an opportunity for both firms and customers to gain. We recognized that industrial sectors, like for instance, the automotive industry, would prefer to buy a set of products like a dashboard or a car door ready to assemble at their automotive plants, rather than to have the responsibility of ordering the mould from mould makers, and the plastic pieces from plastic manufacturers. Both would have something to gain - the automotive industry would save time in marketing and costs and would benefit from the mould makers' technical knowledge, and mould makers would establish proficient long-term relationships with customers, and overcome competition".

Prospectors are more committed to adding value for customers: they have created new departments specialised in mould engineering and plastic injection tasks, or else have created new firms specialised in these various capabilities, and specialised their mould production. These findings are also significant for Analysers and Defenders which can subcontract the services of specialised firms and increase their firms' competitiveness.

It is also interesting to see that Prospectors concentrated most on marketing. As Miles and Snow suggest, for Prospectors "marketing and product development are regarded as most crucial" (1978:64). The findings here conform to Miles and Snow (1978). Shortell and Zajac (1990) also investigated whether organisations classified as Prospectors were likely to place a greater emphasis on new services, new market development strategies and offering more diversified services that were not part of their core business than Defenders. Shortell and Zajac's (1990) results showed that Prospectors had the highest score and Defenders the lowest in new-market, new-service development. Analysers occupied an intermediate position. Support was found in this study for Miles and Snow's (1978) and Shortell and Zajac's (1990) findings. In summary Prospectors were more likely than either Defenders or Analysers to offer more diversified services that were not part of their core business as they moved their position in the value chain.

Figure 35 - Cross-tabulation, strategy types and the service-product augmentation, 1996

Strategy Types 96	Product definition-product design	Product definition-prototyping	Mould design	CAD/CAM/CAE	Mould base	Marketing	Mould manufacture	Mould try out	Production of plastic pieces	Assembling of plastic pieces	Assembling of plastic pieces with other materials
Defender	5.6%	5.6%	50.0%	61.1%		38.9%	100.0%	11.1%			
Prospector	56.3%	50.0%	93.8%	87.5%	12.5%	56.3%	100.0%	25.0%	18.8%		6.3%
Analyser	19.2%	11.5%	65.4%	69.2%		38.5%	100.0%	15.4%	11.5%	7.7%	11.5%
Reactor			33.3%	33.3%			100.0%				
Total	23.8%	19.0%	66.7%	69.8%	3.2%	41.3%	100.0%	15.9%	9.5%	3.0%	6.3%

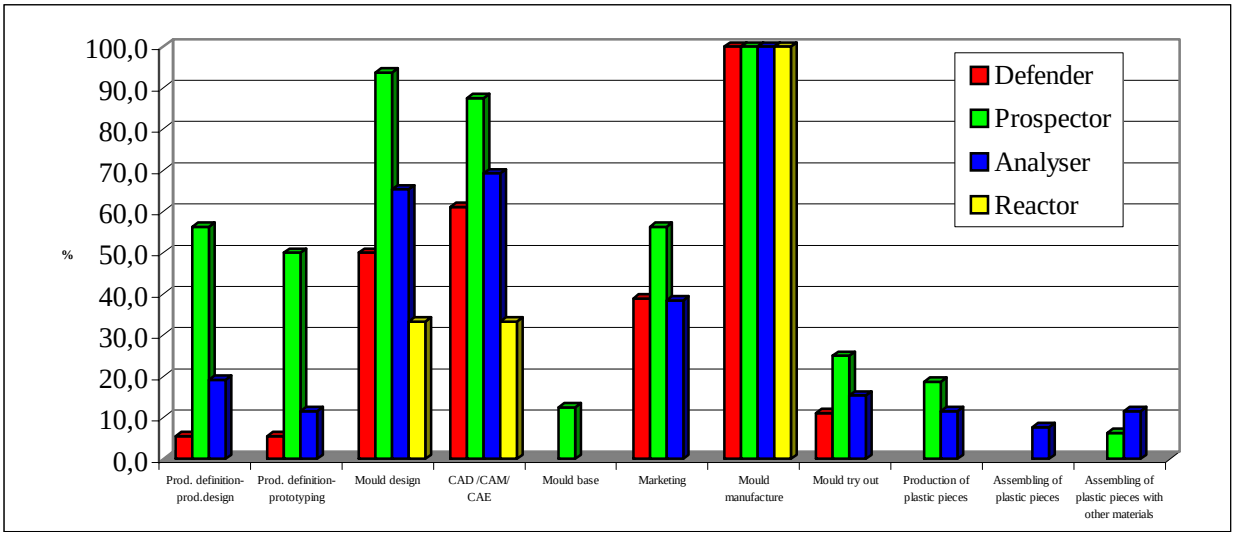


Table 9 - Cross-tabulation, chi-square test, strategy types and the product definition-product design, 1996

Strategy Types 96 * Product definition-design

Cross tab

			Product definition-design		Total
			no	yes	
Strategy Types 96	Defender	Count % within Strategy Types 96	17 94,4%	1 5,6%	18 100,0%
	Prospector	Count % within Strategy Types 96	7 43,8%	9 56,3%	16 100,0%
	Analyser	Count % within Strategy Types 96	21 80,8%	5 19,2%	26 100,0%
	Reactor	Count % within Strategy Types 96	3 100%		3 100,0%
Total		Count % within Strategy Types 96	48 76,2%	15 23,8%	63 100,0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13,826 [a]	3	,003
Likelihood Ratio	14,047	3	,003
Linear-by-Linear Association	0,46	1	,831
N of Valid Cases	63		

a 4 cells (50,0%) have expected count less than 5. The minimum expected count is, 71.

Table 10 - Cross-tabulation, chi-square test, strategy types and the product definition-prototyping, 1996

Strategy Types 96 * Product definition-prototyping

Cross tab

			Product definition-prototyping		Total
			no	yes	
Strategy Types 96	Defender	Count	17	1	18
		% within Strategy Types 96	94,4%	5,6%	100,0%
	Prospector	Count	8	8	16
		% within Strategy Types 96	50,0%	50,0%	100,0%
	Analyser	Count	23	3	26
		% within Strategy Types 96	88,5%	11,5%	100,0%
	Reactor	Count	3		3
		% within Strategy Types 96	100%		100,0%
Total		Count	51	12	63
		% within Strategy Types 96	81,0%	19,0%	100,0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13,723[a]	3	,003
Likelihood Ratio	12,850	3	,005
Linear-by-Linear Association	0,54	1	,817
N of Valid Cases	63		

a 5 cells (62,5%) have expected count less than 5. The minimum expected count is, 57.

Are there differences in the marketing policy of different strategy types?

Mould makers were asked to identify how they deal with their customers and how they promote themselves (1996). The research results reveal (see Figure 36) that the overwhelming majority of firms deal directly with their customers (97%). Defenders depend most on intermediary firms, whether Portuguese (89%) or foreign (33%), to sell abroad. As mentioned previously, Defenders are highly skilled in the mould manufacturing process but they tend to lack management skills, international business knowledge and fluency in English to sell abroad. Defenders emphasise efficiency, cost-minimisation and a degree of conservatism and thus they tend to invest least in seeking potential customers overseas which is an expensive task requiring both human and financial resources. Prospectors were least dependent on others agencies or intermediaries to sell their product.

The most important way for firms to promote themselves (see Figure 37) is through participation at international exhibitions fairs (76%) and sending mail shots to potential customers (68%). Prospectors were more aggressive in their promotion activities than any other strategic type: they send mailings to their potential customers (94%), attend international exhibitions fairs (94%), participate at trade missions (63%) and participate at workshops/seminars and conferences (31%). As suggested by the theory, Analysers fitted in between Prospectors and Defenders. Support was found for Miles and Snow (1978) assertions here. Reactors have shown no emphasis on promotion policy. Both Prospectors and Analysers gave similar importance to advertising in specialist magazines (63% and 62% respectively) and indirect advertising (both 50%). Another interesting fact concerns participation at international exhibitions fairs: Defenders scored higher than Analysers. International exhibitions fairs are financially supported by CEFAMOL (the Portuguese Association for the Mould Industry) and ICEP (Investments, Trade and Tourism of Portugal, a body equivalent to the British DTI), thus providing a major opportunity for Defenders to become known without spending too much of their own resources. Defenders are likely to take advantage of these opportunities, and tend to put pressure on those bodies to be selected and be part of the group that represents Portuguese moulds. International trade fairs are well-advertised events, and are visited by a very specific clientele. Therefore, firms may see this form of organisational promotion as the most advantageous (comparing the costs/results).

In summary, the research findings show that in conformity with the theory, Prospectors placed greater emphasis on marketing than did Defenders. Prospectors tend to deal directly with their customers, and they also accounted for the lowest percentage of the strategic groups that dealt with Portuguese intermediaries. Defenders depended most on both Portuguese and foreign intermediary trading firms to sell abroad. Analysers fitted in between. Reactors did not show any emphasis on marketing. Prospectors were far more aggressive in terms of their promotion policy. Defender organisations were more likely to participate at international exhibitions fairs.

The current research findings are consistent with the findings of earlier researchers: Prospectors are strongly marketing-orientated and they have developed an internal capability to achieve this while Defenders consistently lack a direct marketing

orientation and tend to rely on agencies outside their firms to provide a marketing capability. These findings are consistent with those of Miles and Snow (1978), Snow and Hrebiniak (1980), McDaniel and Kolari (1987), Conant et al (1990) and Salter and Narver (1993). Again, this analysis has revealed that differences in behaviour exist between firms who have adopted different strategic positions.

Figure 36 - Cross-tabulation, strategy types and how firms deal with their customers, 1996

Strategy Types 96	Deals directly	Has agents	Has branches	Deals with Portuguese intermediaries	Deals with Foreign intermediaries
Defender	88.9%	11.1%	11.1%	88.9%	33.3%
Prospector	100.0%	25.0%		50.0%	12.5%
Analyser	100.0%	30.8%	11.5%	73.1%	15.4%
Reactor	100.0%			100.0%	66.7%
Total	96.8%	22.2%	7.9%	73.0%	22.2%

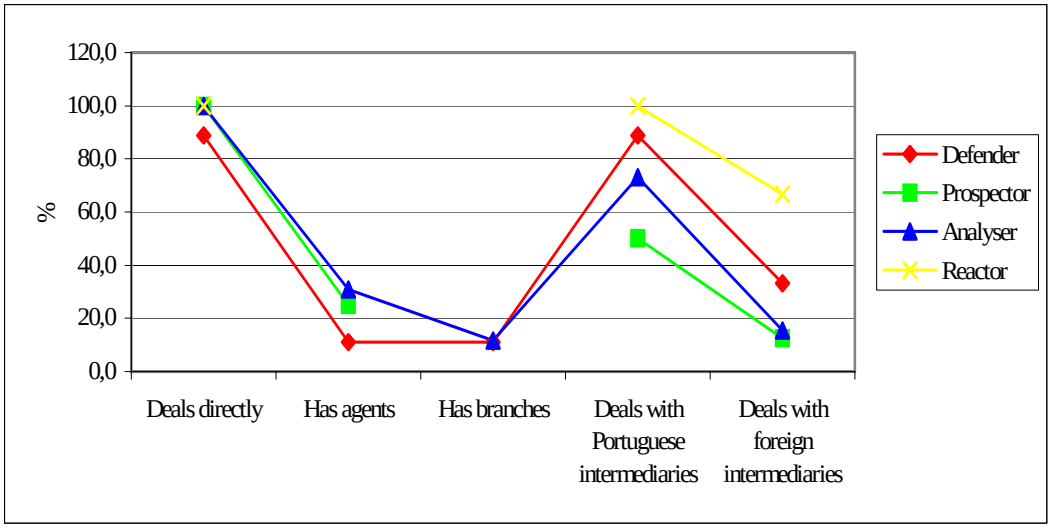
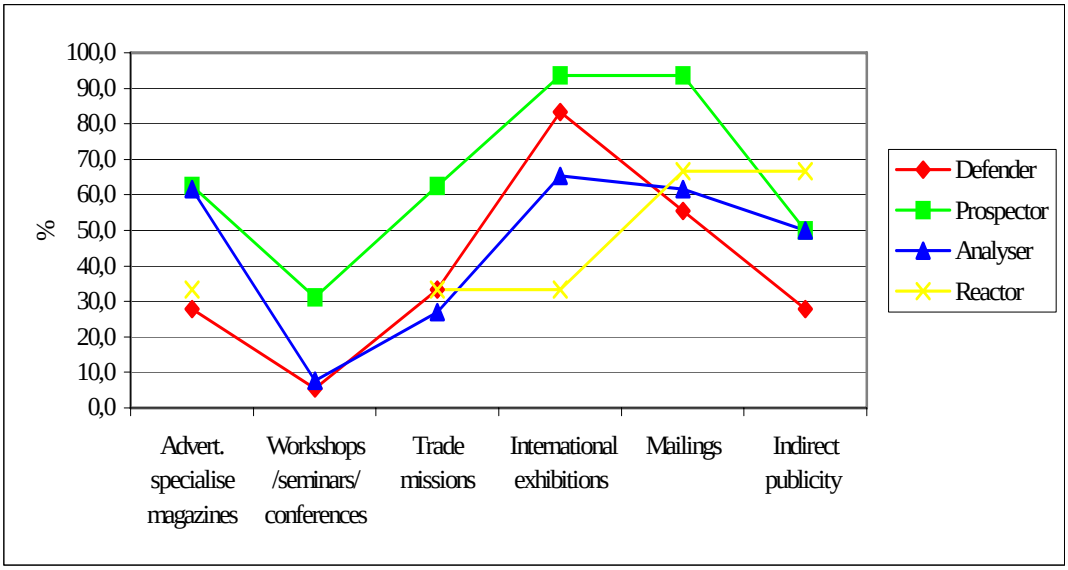


Figure 37 - Cross-tabulation, strategy types and promotion policy, 1996

Strategy Types 96	Advert. Specialise magazines	Workshops /seminars/ conferences	Trade missions	International exhibitions	Mailings	Indirect publicity
Defender	27.8%	5.6%	33.3%	83.3%	55.6%	27.8%
Prospector	62.5%	31.3%	62.5%	93.8%	93.8%	50.0%
Analyser	61.5%	7.7%	26.9%	65.4%	61.5%	50.0%
Reactor	33.3%		33.3%	33.3%	66.7%	66.7%
Total	50.8%	12.7%	38.1%	76.2%	68.3%	44.4%



Are there differences in the investment policies of different strategy types?

Respondents were asked to identify in which areas they have been investing, and the percentage of their investments compared to the organisation's total investments, for 1980-86, 1987-92, 1993-95, 1996 and 1997 (a forecast). The analysis shows as a whole (see Figure 38) that over the years firms have invested primarily in technology. As seen in Chapter 3, firms identified technology as an important factor in achieving competitiveness and so it is consistent that they have invested heavily in it. In 1980-86 two major investments can be distinguished, one in technology and the other in infrastructures (Figure 38A). Firms were opening new production units, so there were two things that they needed: technology to manufacture moulds and premises in which to work. In 1987-92, firms continued to invest heavily in technology (see Figure 38B). It was also in this period that CAD/CAM technology started to be adopted and

embedded in the production process. In 1993-95 firms continued to invest mainly in technology but, it is interesting to note that investments in marketing, customer relationships, training and Research & Development increased significantly compared to preceding periods (Figure 38C). It may be expected that in periods of economic recession firms will hold back on investment. However, this did not happen here as the sector is technologically orientated and capital intensive and mould makers may have perceived that if they stopped investing they would lose the competitiveness. In 1996, as in the previous period, investment in technology continued to be the top priority. It is also interesting to see that investments in infrastructure were once again the second major investment, (as in 1980-86). As new technology is acquired, there is often a need to restructure plant layout.

The findings reveal a clear hierarchy in strategy types related to areas of investment: on average while the environment was stable (with an exception in R&D and infrastructures) Defenders were the group that invested most. However, when there were significant environmental changes, Defenders lost their top position and were replaced by Prospectors who invested significantly more in all areas. According to the theory, Defenders are more suited to stable environments and Prospectors and Analysers fit more dynamic and changeable settings. These findings support the notion that certain environments favour certain strategy types and corroborate the findings of Namiki (1989), Hambrick (1983), Zajac and Shortell (1989) and Shortell, Morrison and Friedman (1990).

Prospectors invested most in R&D, and after 1987-92 they invested significantly more than any other strategy type in marketing, customer relationships and training. This is consistent with Snow and Hrebiniak's (1980) findings, which revealed that Prospector organisations consistently perceived product development, R&D and market research competencies to be highly important. Analysers, as suggested by the theory, occupied an intermediate position between Prospectors and Defenders. Reactors' investments were negligible and much lower than any other strategic type. Regarding 1997 (a forecast) firms expected to maintain the same levels of investments as in 1996 (for more details see appendix 5F)

According to Miles and Snow (1978), Defenders are characterised by stability while Prospectors and Analysers would be more variable and responsive to changing environmental conditions. However, Defenders, Prospectors, Analysers and Reactors all maintained their strategic pattern of investments. The deviations from the theory may underline the particular characteristics of the mould industry, in which constant investment in technology is vital to achieve competitiveness.

Firms were also asked about constraints on investment (1996) and asked to indicate on a scale of 1 (strongly disagree) to 5 (strongly agree), which of a variety of constraints had been most problematic to them. In order to emphasise the differences between strategy types, the total mean was subtracted from the mean of each individual strategy type. As the level of investment by Reactors was insignificant, they were not included in the analysis. The findings demonstrate (Figure 39) that Defenders identified high exchange rate rather than high interest rate as constraints on investments. A possible explanation is that Defenders invest heavily in technology and, as all the technology is imported, their biggest concern is the exchange rate variation (particularly Dollar:Escudo). Defenders sell also mainly to the American market, and as the American Dollar-Escudo exchange rate has been increasing significantly lately, the gains of the American Dollar vs. the Escudo has enabled them, as in the past, to make enough profit to compensate for the interest rate fluctuations. They, therefore, do not see the interest rate as a constraint, and interest rates are in any case much lower nowadays than in the past.

Prospectors identified the fewest items as constraints on investment. Unlike Defenders, Prospectors identified a high interest rate as their major limitation. As we have seen, Prospectors are the strategic group that invests most, and as they produce large to very large moulds, their equipment is extremely expensive and this has implications for them on servicing their debt. Thus, even if the current interest rates are not high, they are influenced by the relatively large amounts of money involved in debt servicing: consequently, they may reflect this by saying that the interest rate is high. Another possible explanation is that they may still remember the high interest rates of the past. Since these firms were the first to be established in the sector, they felt the damaging effect of high interest rates for longer. Their responses may be the residual effect of past problems. Analysers were the group that recognized the most factors as constraints on

investment: a borrowing limit on financial options, low capacity for self-funding, uncertain demand, lack of government support, lack of workforce skills and organisational structure.

Figure 38 - Strategy types and the areas of investment: 1980-96

Figure 38A - The areas of investment, 1980-86

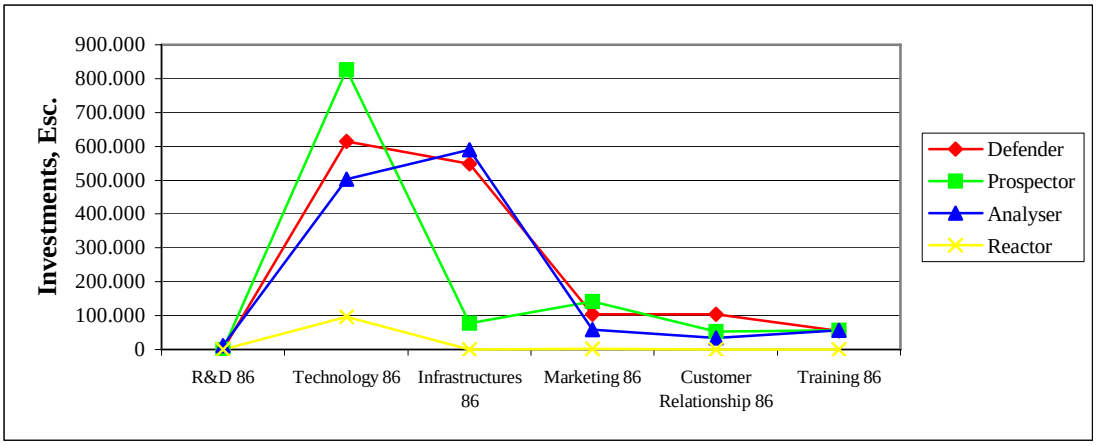


Figure 38B - The areas of investment, 1987-92

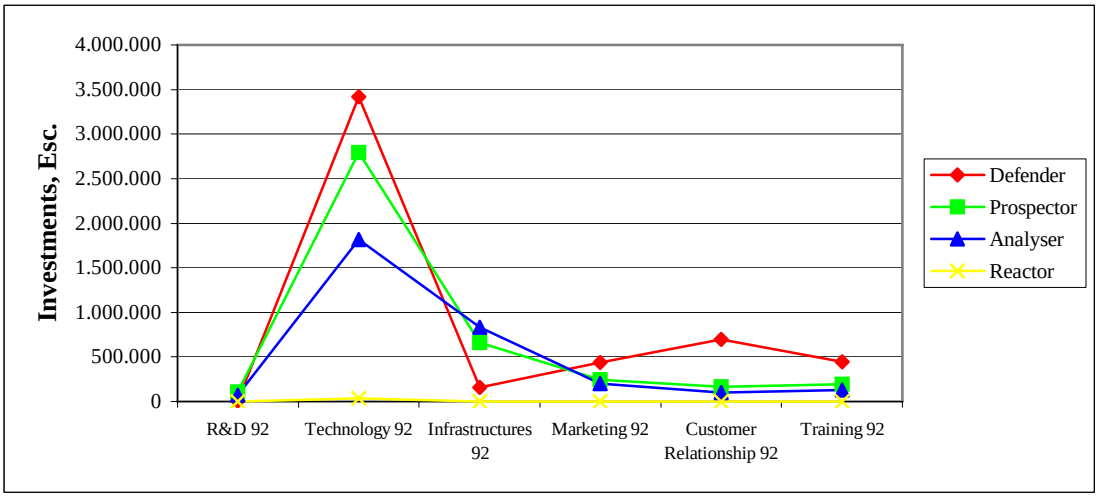


Figure 38C - The areas of investment, 1993-95

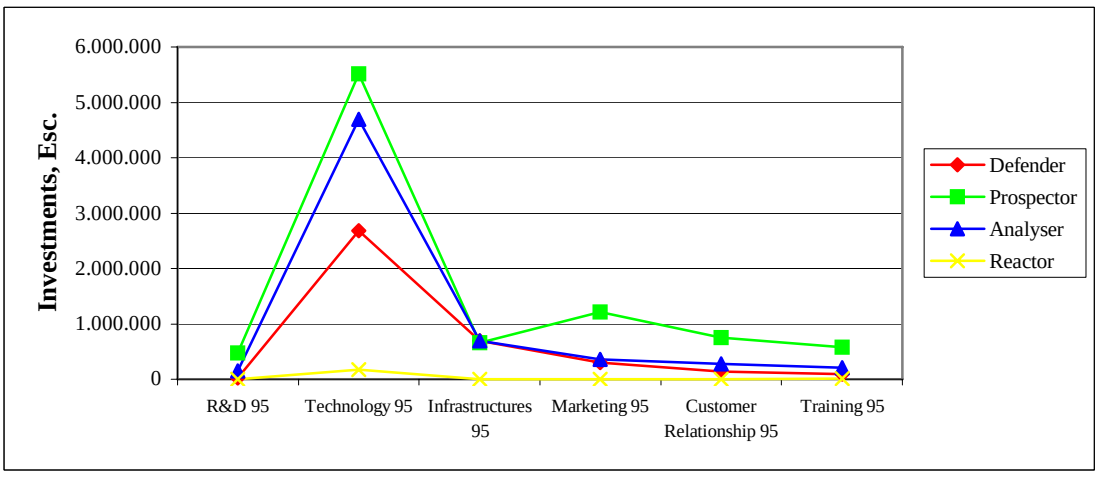


Figure 38 Cont. - Strategy types and the areas of investment: 1980-96

Figure 38D - The areas of investment, 1996

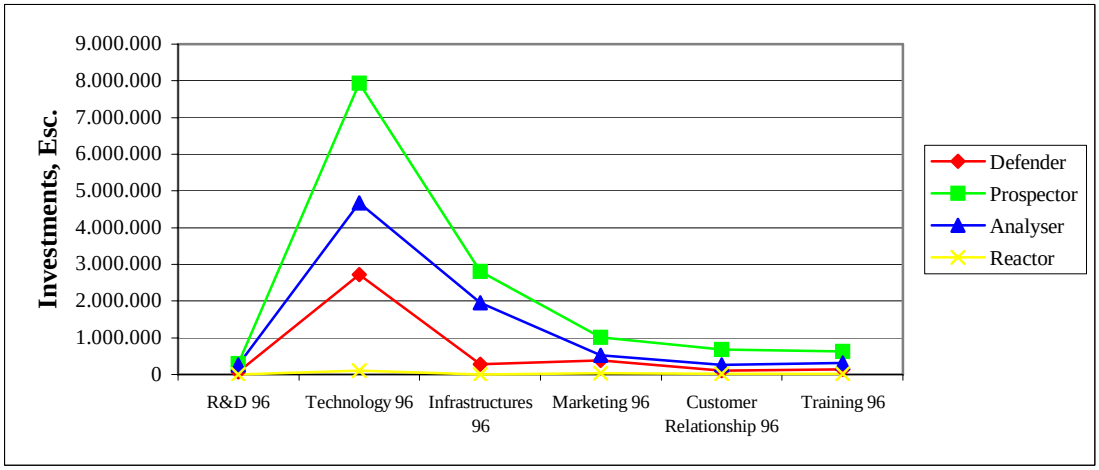
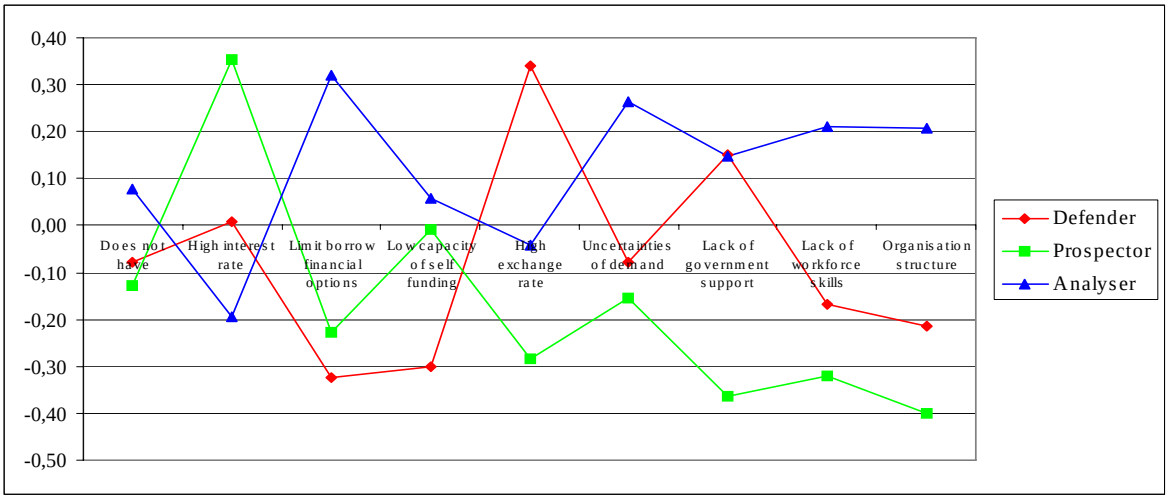


Figure 39 - Means, strategy types and their constraints on investment, 1996

Strategy Types 96	Does not have	High interest rate	Limit borrow financial options	Low capacity of self funding	High exchange rate	Uncertainties of demand	Lack of government support	Lack of Workforce skills	Organisation structure
Defender	2,11	3,28	2,28	2,33	2,50	2,89	3,39	3,28	2,50
Prospector	2,06	3,63	2,38	2,63	1,88	2,81	2,88	3,13	2,31
Analyser	2,27	3,08	2,92	2,69	2,12	3,23	3,38	3,65	2,92
Reactor	2,67	3,00	3,00	4,00	2,00	2,00	3,00	4,33	4,33
Total	2,19	3,27	2,60	2,63	2,16	2,97	3,24	3,44	2,71

Strategy Types 96	Does not have	High interest rate	Limit borrow financial options	Low capacity of self funding	High exchange rate	Uncertainties of demand	Lack of government support	Lack of Workforce skills	Organisation structure
Defender	-0,08 a)	0,01	-0,33	-0,30	0,34	-0,08	0,15	-0,17	-0,21
Prospector	-0,13	0,36	-0,23	-0,01	-0,28	-0,16	-0,36	-0,32	-0,40
Analyser	0,08	-0,19	0,32	0,06	-0,04	0,26	0,15	0,21	0,21
Reactor	0,48	-0,27	0,40	1,37	-0,16	-0,97	-0,24	0,89	1,62
Total	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00



Note: In order to emphasise differences between strategies, the total mean was subtracted from the mean of each single strategy type.

In summary, the findings show that, generally, firms invested most in technology and that in stable periods Defenders invested most while in unstable periods, Prospectors invested most. In dynamic environments Analysers, conforming to the theory, occupied an intermediate position between Prospectors and Defenders. Reactors' investments were negligible. Contrary to the theory, all strategy types have maintained their pattern of investments over the timescales justifiable by the particular characteristics of the mould industry that perceived investment in technology as their key competitive factor. Regarding constraints on investment, Defenders identified a high exchange rate and Prospectors a high interest rate as constraints on investment. Prospectors identified the fewest constraints on investment and Analysers were those that recognized the most (a borrowing limits, low capacity for self-funding, uncertain demand, lack of government support, lack of workforce skills and the implications of organisational structure). Overall, the findings concur with the "entrepreneurial dimension" of Miles and Snow's strategic typology.

Having analysed the differences between strategy types and their investment policy, the following research aim is to identify differences between strategy types and technological profile, i.e. the current research attempts to test the "engineering dimension/problem" of the typology.

Are there differences in the technological profile of different strategy types?

As suggested by Miles and Snow (1978), Defenders focus and compete on efficiency and one way to achieve this is through cost efficient technology, i.e. they tend to have a single core technology. As a result, is expected that Defenders will invest more in CAD/CAM/CAE, CNC systems and EDM than Prospectors and that they will have a shorter engineering process time as well as higher technological productivity (i.e. higher capacity utilisation-working in shifts and a higher "automation ratio" in which "standard products" for longstanding customers are produced by "standard processes". Hambrick (1983) explored whether Defenders had a greater capacity utilisation than Prospectors.

He concluded that no significant differences were found between Defenders and Prospectors in capacity utilisation: this contradicts Miles and Snow (1978). According to the theory, Prospectors are pioneers both in the use of new technology and in the use of multiple technologies. So, it is expected that, besides core technology, Prospectors will employ multiple and sophisticated leading edge technologies such as wire cutting, quality control and test injection.

Respondents were asked to identify the technologies in which they had invested, the frequency of their re-engineering process, whether their organisation worked in shifts, and their automation ratio. They were also asked to identify the percentage invested in each technology as a percentage of total investments (for 1980-96). In aggregate, the analysis illustrates that over time firms changed the technology in which they invested. Investments in specific technologies have been analysed with respect to each of the timescales. In 1980-86, firms mainly invested in conventional equipment (Figure 40A). This was to be expected, because in mould production, conventional technology was the type most commonly used and the shortage of financial resources at the beginning of a firm's life would make it impossible to buy any other. In the subsequent period, 1987-92, firms mainly invested in CAD/CAM/CAE and CNC systems (Figure 40B). Despite the fact that at the beginning of the 80s CAD/CAM systems were bought for the first time in Europe by a Portuguese mould firm in Marinha Grande, it was only in this period that the technology became widely used as it required a major investment. In 1993-95, firms invested particularly in CNC systems (Figure 40C). CNC systems increase a firm's competitiveness; significantly shorten mould delivery times and minimise human error. They can also work continuously, especially when they incorporate automatic change tools. In 1996, most managers chose to acquire CAD/CAM/CAE systems and then CNC systems (Figure 40D). It is also important to note that investments in quality control and test injection equipment increased over the timescales (Figure 40). Investments in quality control are important as customers have become more demanding and it is necessary to meet their quality measurement requirements. The acquisition of test injection equipment can be explained by the increased competition. In order to differentiate their strategy, and to add value for customers, firms extended their value chain forwards: instead of producing just the

mould, they started to manufacture plastic pieces. This reflects the changed sectoral pattern of sales reported earlier (for further details see also appendix 5G).

Until 1987-92, Defenders invested most in technology, and after this period (following significant environmental changes), it was Prospectors who assumed the lead role in technology investment. It is suggested, as seen above in the context of investment policy, that Defenders fit stable environments and Prospectors more dynamic ones, which explains their different strategic behaviour and technological investment patterns before and after 1987-92. Reactors' investments in technology were insignificant. The findings conform to the theory, as they suggest that Defenders are most suited to stable environments and Prospectors are more suited to more dynamic settings. They also support the notion that different environments favour different strategy types thus corroborating the findings of Namiki, (1989), Hambrick, (1983), Zajac and Shortell, (1989) and Shortell, Morrison and Friedman (1990).

Figure 40 - Strategy types and technological investments, 1980-96

Figure 40A - The technology in which firms invested, 1980-86

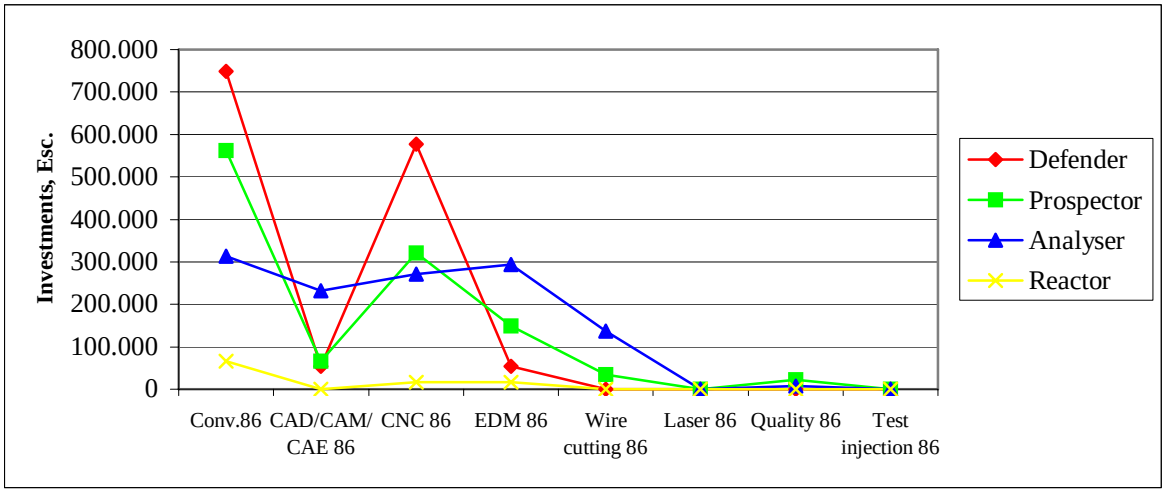


Figure 40B - The technology in which firms invested, 1987-92

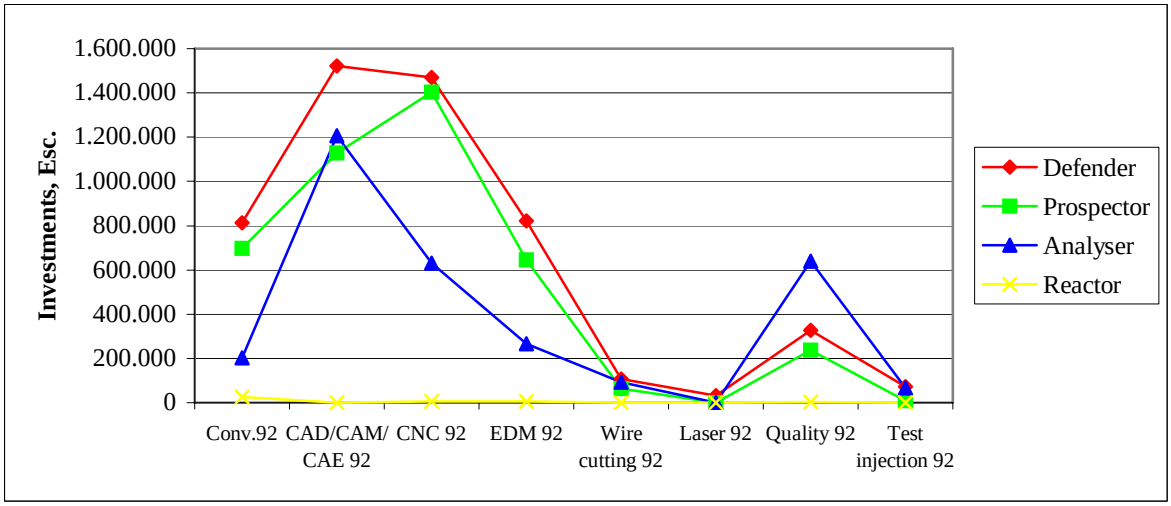


Figure 40C - The technology in which firms invested, 1993-95

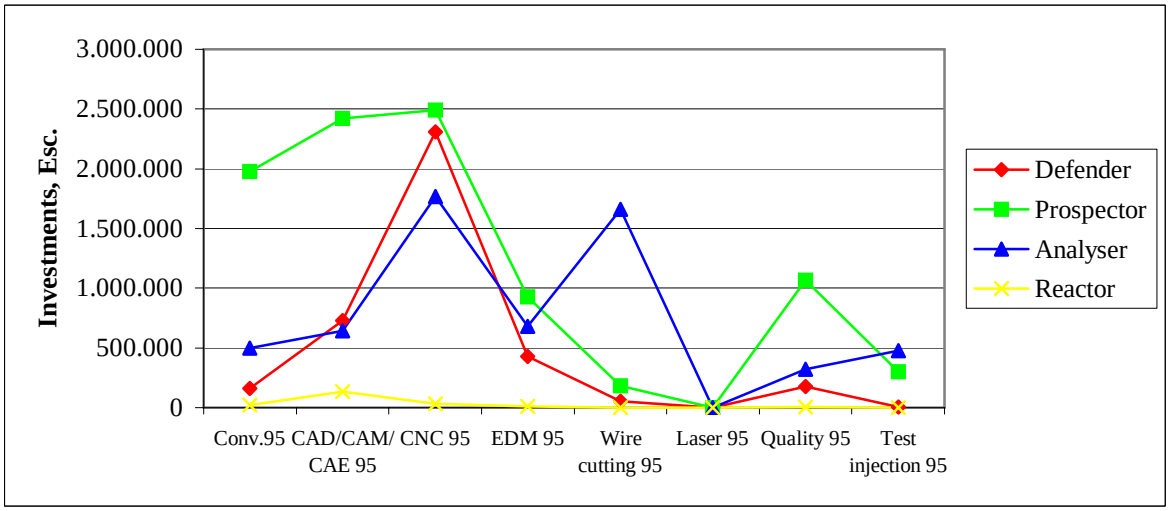
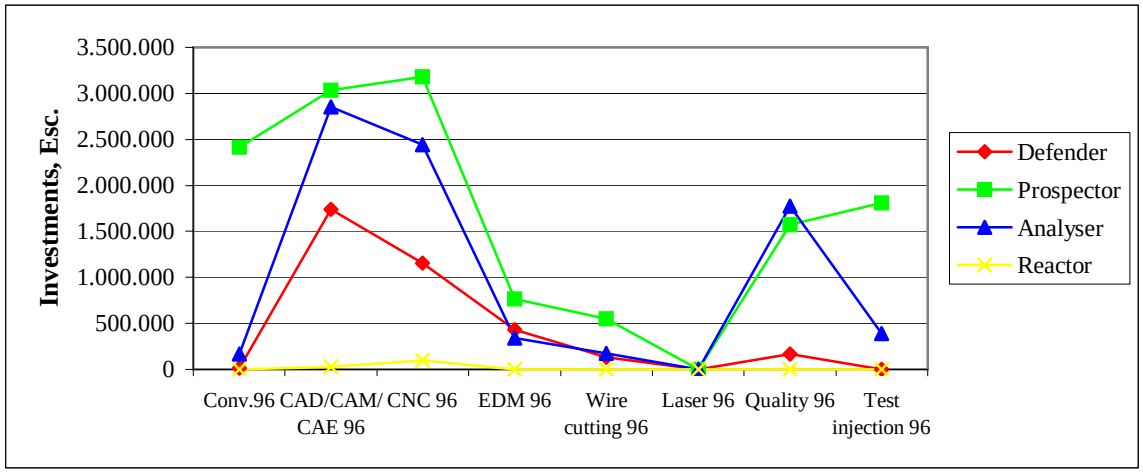


Figure 40 Cont. - Strategy types and technological investments, 1980-96

Figure 40D - The technology in which firms invested, 1996



The analysis also shows that over the timescales Defenders invested continuously in their core technology (i.e.CAD/CAM/CAE, CNC and EDM) while Prospectors and Analysers invested in a variety of technologies (conventional equipment-including tools, CAD/CAM/CAE, CNC systems, EDM, wire cutting, quality control and test injection equipment). As suggested by Miles and Snow (1978), Defenders tend to invest in a single core technology whereas Prospectors tend to use multiple technologies. For 1997 is expected that firms increase their investments in technology or maintain them at the 1996 levels; their major investments will be in CAD/CAM/CAE and CNC systems.

In addition, regarding the engineering dimension of the typology, mould makers were asked to identify their frequency of technological re-engineering. The findings reveal that (with the exception of quality control equipment, in which the chi-square test was significant) there were no significant differences between strategy types (see Table 11). Contrary to the theoretical expectations, Defenders did not have shorter re-engineering time-cycles. They have shorter re-engineering time cycles for CAD/CAM/CAE systems (their core technology) but longer ones for quality control and test injection equipment. Defenders update their CAD/CAM/CAE systems within one year, while Prospectors and Analysers take 1-2 years to do it. Defenders take 6-10 years to renovate their quality control equipment compared with Analysers, who take 3-5 years. They take over 10 years to substitute their injection test equipment, while Prospectors and Analysers take

6-10 years. For CNC systems, EDM and wire cutting equipment, all strategy types take 3-5 years to renew their technology (see Figure 41). A possible explanation is that Defenders tend to manufacture medium capacity-medium complexity moulds, which generate lower returns than large to very large moulds of medium capacity. While a mould for a toy (e.g. a very complex mould such as a truck with very small pieces like wheels, windscreen, bumper, tyre, rim, etc. fitting all together) can cost Esc14, 000,000 a mould for a vacuum cleaner (large mould medium complexity) can cost more that double that sum. Defenders, therefore, need to sell twice as much as Analysers and Prospectors to generate enough return to replace their equipment - consequently, they tend to prioritise investing in their core technology.

In relation to productivity, mould makers were asked to specify whether their organisations work in shifts and, if so, the number of shifts they work for each technology (1996). The results reveal (see Figure 42) that, contrary to expectations, Prospectors and Analysers are more likely to work a shift system (81% and 77% respectively) than Defenders (39%). It is suggested that Defenders, contrary to the theoretical expectations, are small firms, and as such have financial constraints. When they accept a mould order, they need to analyse whether they can finance its production or not. It may be that, even if they are not working to full capacity, they are not interested in accepting any other mould order because of their difficulties in financing its production and that therefore they do not need to work in shifts. The findings also show (see Figure 43) that firms work primarily in two shifts, and mainly with CNC systems and EDM equipment. Prospectors and Analysers, rather than Defenders, scored highest in term of capacity utilisation and this is contrary to what might be expected. The findings show that Portuguese mould maker firms have low levels of productivity. Hambrick (1983), explored whether Defenders had a greater capacity utilisation than Prospectors. He concluded that no significant differences were found between Defenders and Prospectors in capacity utilisation, which contradicts the theory.

Respondents were also asked to identify their automation ratio (i.e. equipment controlled by the number of employees, for each technology). The analysis demonstrates that there were no significant differences between strategy types. With the exception of CNC systems and EDM equipment, in which two items of equipment were

controlled mainly by one employee (61% and 55% respectively), in the cases of all other technology, the automation ratio was one item of equipment controlled by one employee (see Figure 44 and for further details see Table 5G7 in appendix 5G9). These findings have significant managerial implications, as they reveal that the sector is characterised by low productivity levels. In order to be competitive on the mould delivery time and more efficient (the technology is quite expensive, so the greater its use, the easier it is to pay back the investment), firms should have their technology operating in three shifts, as well as a high automation ratio.

The research results show that over time firms changed the technology in which they have invested. Until 1987-92, Defenders invested most in technology, and after this period (following significant environmental changes), Prospectors assumed this position. The findings conform to the theory, which suggests that Defender organisations are suitable for stable environments and Prospectors for more dynamic settings and support the notion that different environments favour different strategy types corroborating Namiki, (1989), Hambrick, (1983), Zajac and Shortell, (1989), and Shortell, Morrison and Friedman's (1990) findings. The analysis also shows that over the period Defenders invested continuously in their core technology, whereas Prospectors and Analysers invested in varied technologies. Support was found for Miles and Snow's (1978) assertion that Defenders tend to invest in a single core technology with a view to making efficiency gains while Prospectors tend to use multiple technologies with a view to improving effectiveness.

However, contrary to the theoretical expectations, Defenders have shorter re-engineering time-cycles, but only for their core technology (CAD/CAM/CAE and CNC systems and the EDM equipment). They take longer to renew what is not their main technology (quality control and their test injection equipment). These findings suggest that different strategy types have different technological priorities which may be related to differences in abilities to access financial resources). Furthermore, and against expectations, most Prospectors and Analysers, in contrast to Defenders, work in shifts. Prospectors and Analysers work mainly in two shifts, particularly with CNC systems and EDM equipment. The theory suggests that Defenders produce with a view to efficiency. It would therefore be expected that Defenders would make the most of their

technology by working continuously. Hambrick (1983) in his research showed that no significant differences were found between Defenders and Prospectors in capacity utilisation. There were no significant differences between strategy types on the automation ratio measure. These findings have important managerial implications as they illustrate the low productivity of the Portuguese mould industry. While investments have been made in technology, there is evidence that competitiveness is being undermined by an inability to make full use of technology.

Overall, these findings support the engineering dimension of Miles and Snow's strategic typology. The inconsistencies found for Defender in relation to re-engineering time-cycles and technological productivity (working in shifts and automation ratio) may be a result of the particular characteristics of this industry, i.e. they may be a consequence of the firm size of Defenders, which the theory expects to be large firms, but as suggested in discussion with Portuguese mould managers are small firms.

Table 11 - Cross-tabulation, chi-square test, strategy types and the technological re-engineering process, 1996

Strategy Types 96 * Re-engineering quality control equipment

Cross tab

			1-2 years	3-5 years	6-10 years	Over 10 years	Total
Strategy Types 96	Defender	Count % within Strategy Types 96		3 25, 0%	9 75,0%		12 100,0%
	Prospector	Count % within Strategy Types 96	6,0 37,5%	6,0 37,5%	3,0 18,8%	1 6,3%	16 100,0%
	Analyser	Count % within Strategy Types 96	6,0 37,5%	8,0 50,0%	1,0 6,3%	1 6,3%	16 100,0%
Total		Count % within Strategy Types 96	12,0 27,3%	17,0 38,6%	13,0 29,5%	2 4,5%	44 100,0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18,329 [a]	6	,005
Likelihood Ratio	21,005	6	,002
Linear-by-Linear Association	7,442	1	,006
N of Valid Cases	44		

a 10 cells (83,3%) have expected count less than 5. The minimum expected count is, 55.

Figure 41 - Cross-tabulation, strategy types and the technological re-engineering process, 1996

Figure 41A - Conventional equipment

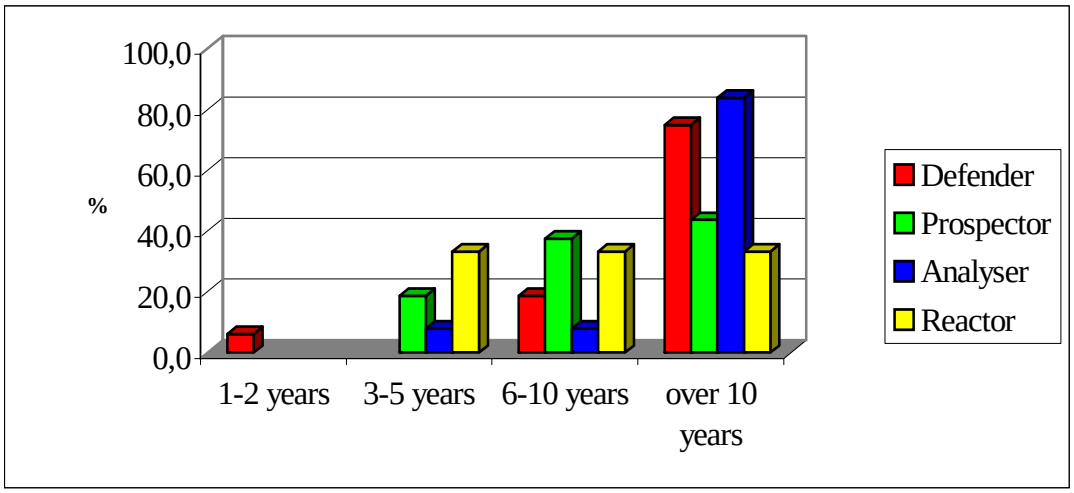


Figure 41B - CAD/CAM/CAE systems

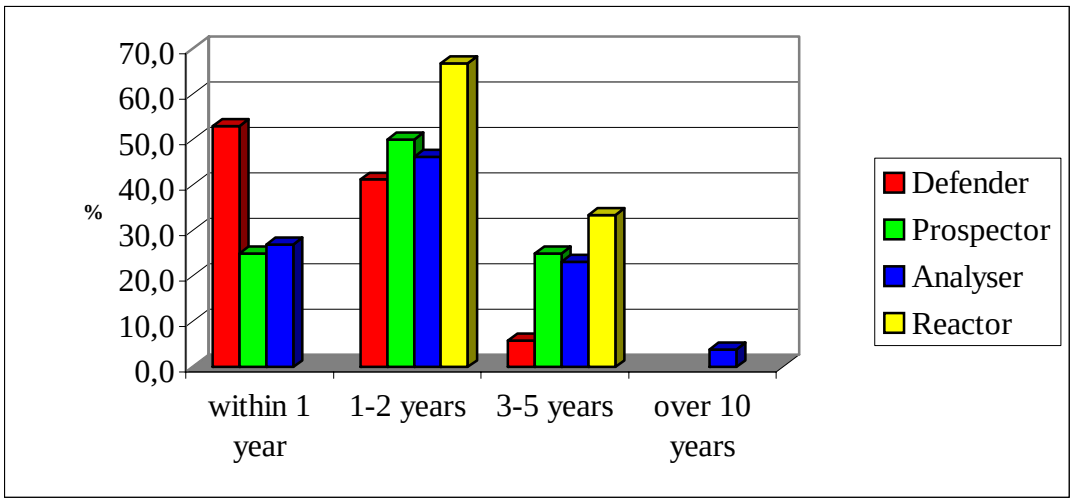


Figure 41C - CNC systems

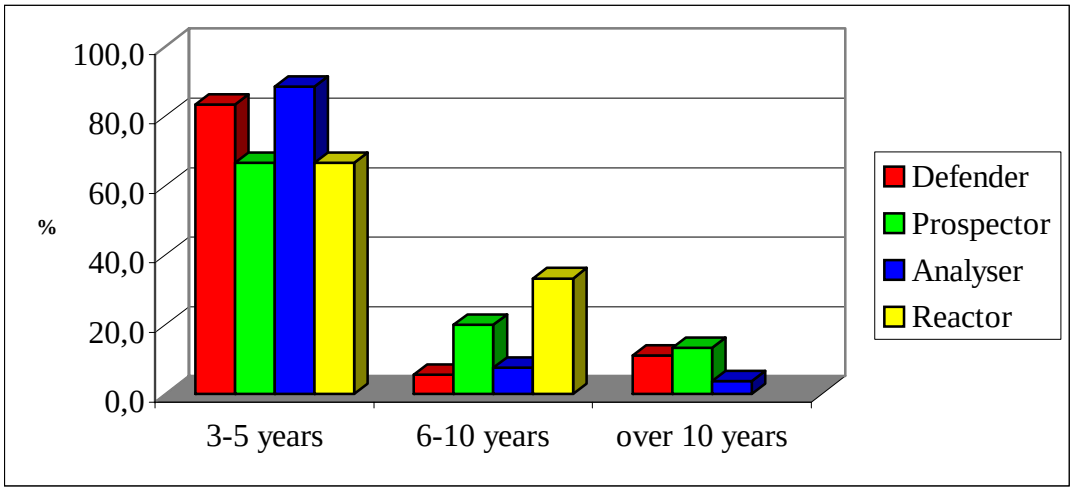


Figure 41 Cont. - Cross-tabulation, strategy types and the technological re-engineering process, 1996

Figure 41D - EDM equipment

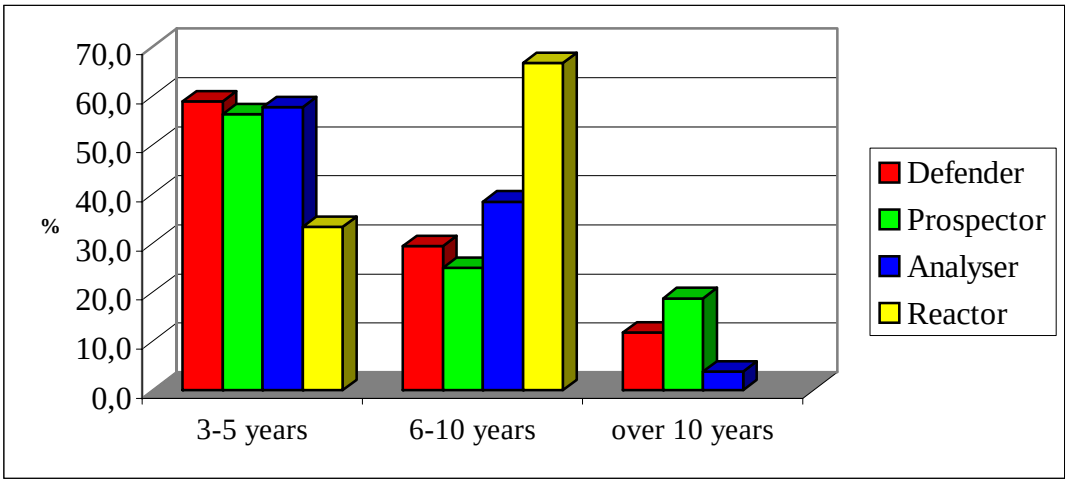


Figure 41E - Wire cutting equipment

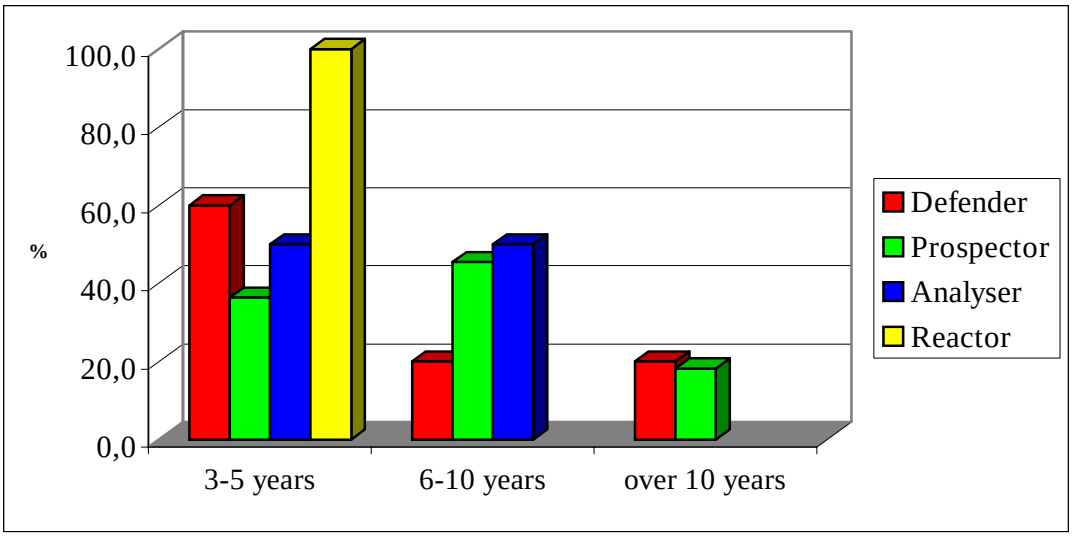


Figure 41F - Laser equipment

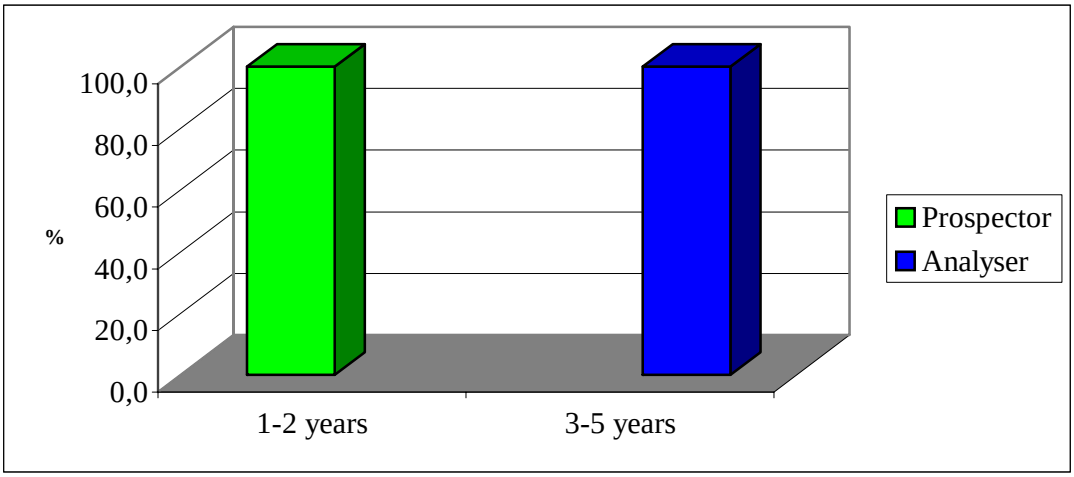


Figure 41 Cont. - Cross-tabulation, strategy types and the technological re-engineering process, 1996

Figure 41G - Quality control equipment

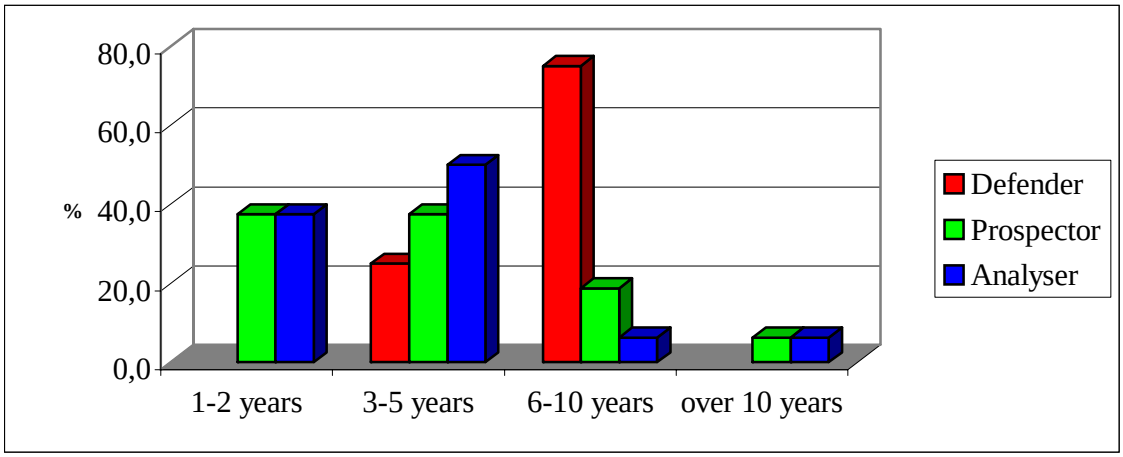


Figure 41H - Injection test equipment

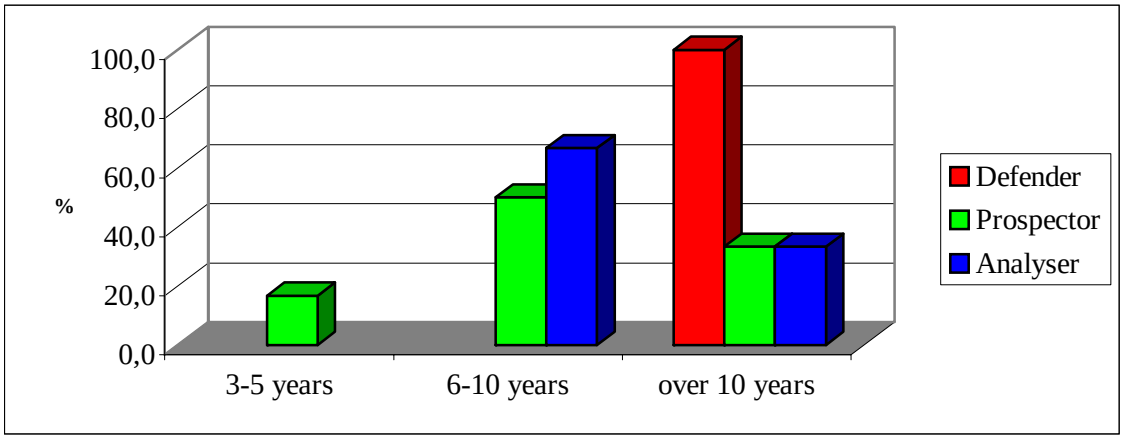


Figure 42 - Cross-tabulation, strategy types and firms working in shifts, 1996

Strategy Types 96 * Working in shifts Cross-tabulation % within Strategy Types 96

Strategy Types 96	Working in shifts Yes	No	Total
Defender	38,9%	61,1%	100,0%
Prospector	81,3%	18,8%	100,0%
Analyser	76,9%	23,1%	100,0%
Reactor	33,3%	66,7%	100,0%

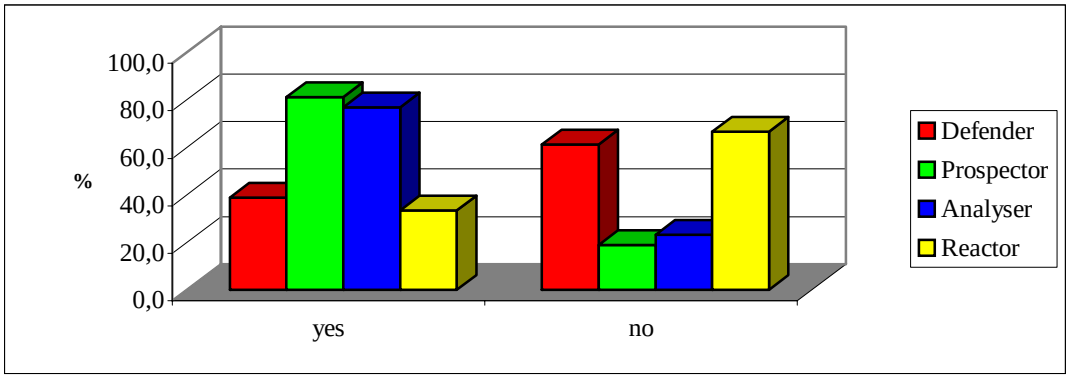


Figure 43 - Cross-tabulation, strategy types and the technology in which they work in two shifts, 1996

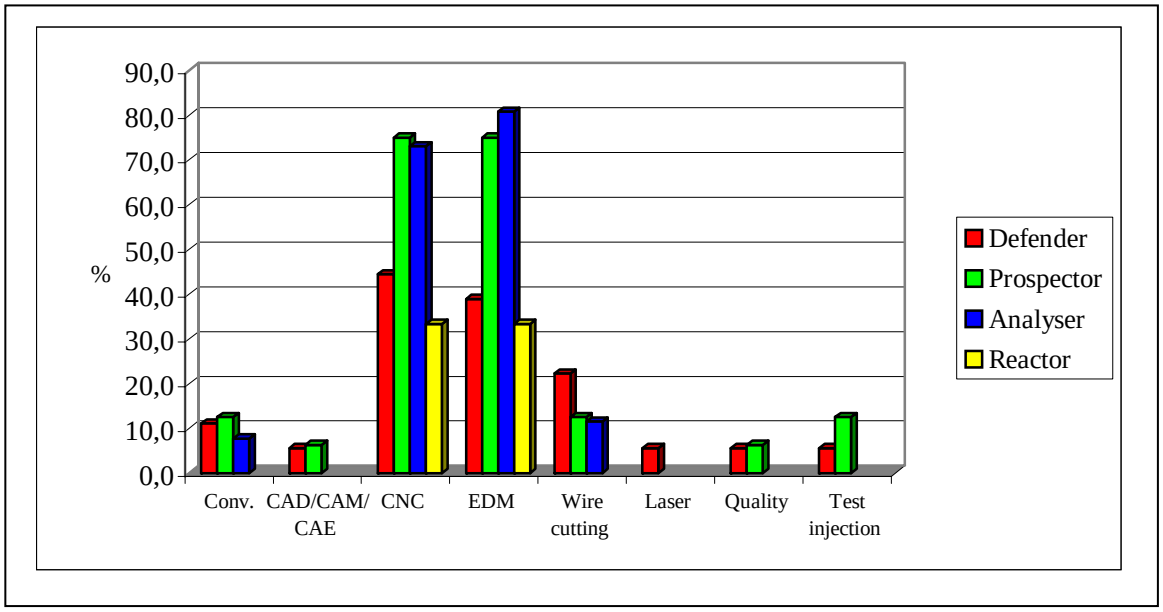
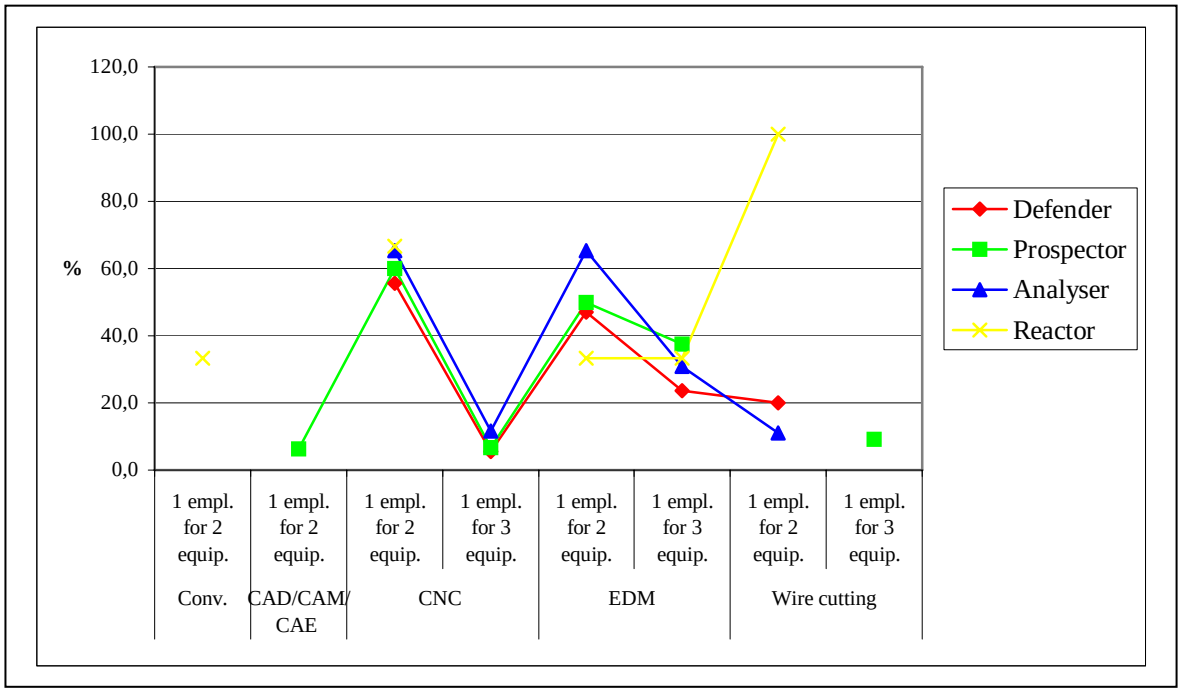


Figure 44 - Cross-tabulation, strategy types and the technology automation ratio: 1 employee for 2 items of equipment, and 1 employee for 3 items of equipment



Having analysed the differences between strategy types and their technological profiles, the next objective is to identify if there are differences between the workforce and training policies of different strategy types.

Are there differences in the organisational size, workforce and training policy of different strategy types?

Respondents were asked to identify the number of employees; their occupational characteristics and if they had experienced difficulties in recruitment. On training policy, firms were asked to specify whether they had a training policy, what aspects of training were covered, whether employees left their organisation after being trained, and who was responsible for training. Data was collected for 1996.

The theory suggests that Defenders are efficient firms and that they focus on low cost production: consequently, they are expected to be large firms. Prospectors are perceived as flexible, so they are assumed to be smaller than Defenders. As Miles and Snow (1978:68) see Analysers as having blend of Prospector and Defender characteristics, we might expect Analysers to be mid-range firms in terms of the numbers of employees. Miles and Snow (1978:68) typified the "Analyser firm" as "a medium-sized and very profitable company". Reactors are more likely to be very small or micro-businesses.

The analysis shows (Figure 45) that 30,2% of firms had between 30-49 employees, 30,2% had between 50-99 employees, 23, 8% had up to 29 employees and 15,9% had more than 100 employees. If the European Commission's definition of small firms is used (i.e. micro-enterprises employing 0-9 people; small enterprises employing 10-99 people and medium-sized enterprises employing 100-499 people), it is clear that most respondents fall into the small-sized firm category. In this study, in order to have distinctive categories, firms are categorised thus: small firms have up to 29 employees; medium firms have between 30-49 employees; large firms have between 50-99 employees; and, very large firms have more than 100 employees (due to the specific characteristics of this industry, a firm with more than 100 employees is considered a very large firm).

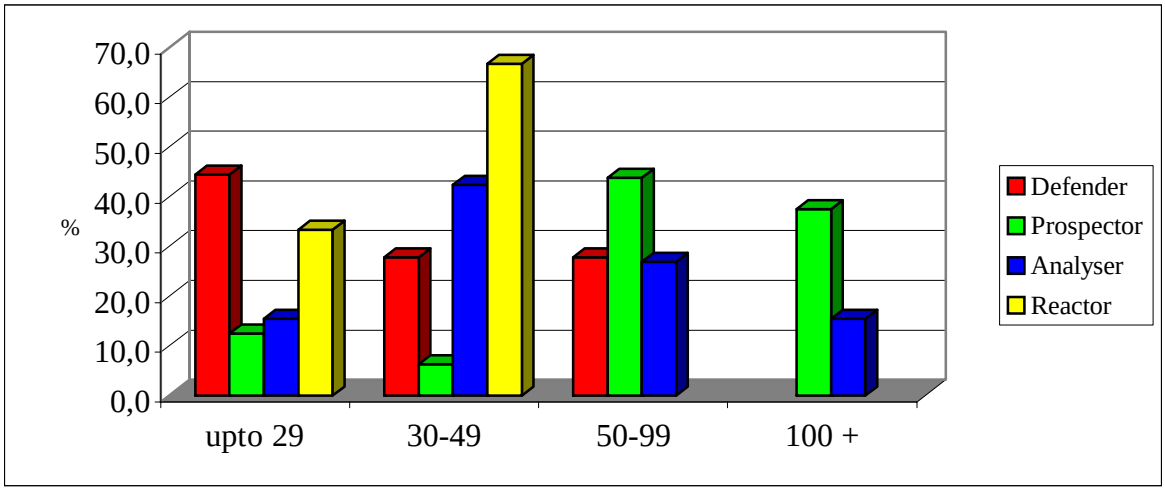
The findings also reveal that, contrary to the theoretical expectations, the majority of Defenders (44,4%) were small firms. Analysers (42,3%) were predominantly medium sized firms and Prospectors were predominantly large and very large firms (43,8%, and 37,5%, respectively). Reactors were medium firms (66,7%). The size categorisation and

its mapping onto the Miles and Snow's (1978) typology is not consistent with earlier findings and this may reflect the particular characteristics of the Portuguese mould industry. Prospectors are those organisations that have been established in the market place for longer; they were established in the very early phase of the development of the industry (in the 50s, 60s and 70s). They therefore accompanied the growth of the industry, and they are large to very large firms. Defenders started their activity in the beginning of the 80s; they are mainly those firms composed of personnel who left long-established organisations specialising in one aspect of mould production.

Figure 45 - Cross-tabulation, strategy types and organisational size, 1996

Strategy Types 96 * organisational size Cross-tabulation % within Strategy Types 96

	Firm size				
	Small	Medium	Large	Very large	
Strategy Types 96	Up to 29	30-49	50-99	100 +	Total
Defender	44,4%	27,8%	27,8%		100,0%
Prospector	12,5%	6,3%	43,8%	37,5%	100,0%
Analyser	15,4%	42,3%	26,9%	15,4%	100,0%
Reactor	33,3%	66,7%			100,0%
Total	23,8%	30,2%	30,2%	15,9%	100,0%



Smith et al. (1989) investigated Miles and Snow's typology and firm size and performance. They concluded that Analysers were primarily large firms and Reactors small firms. Few differences existed between the size distribution of Defenders and Prospectors. Prospectors and Defenders were smaller than Analysers and larger than Reactors. Therefore, both the current and Smith et al.'s (1989) results contradict Miles and Snow's (1978) view on the relationship between firm size and strategy type.

Prospectors are described in the typology as being flexible and innovative: these are normally considered to be characteristics of small firms. However, they are also seen as having a broad market definition, product diversity, a divisional structure (i.e. they are multi-functional) and as spending heavily on R&D: these are seen as features typical of large firms. Thus, Prospectors cannot be either too large or too small as being too large would restrict their flexibility while being too small would circumscribe their ability to fund R&D. This is an important paradoxical aspect to the model and there seems to be no clear relationship between firm size and strategic behaviour as defined by the Miles and Snow approach.

Additionally, the analysis reveals that there were no significant differences between strategy types and the number of employees per occupational category: all firms employ primarily skilled employees (see Figure 46). There were also no significant differences between strategy types and the average age of employees for each category (see Figure 47). However, employees in Defenders tended to be younger and in Prospectors tended to be older. Prospectors, as we have seen, were the first firms to be established in the market place, so most of their employees may have been with them since their very beginnings. Smith et al. (1989) found in their research that Prospectors were managed by younger employees. Thomas and Ramaswamy (1986), in their study, concluded that Prospectors had higher levels of education and were significantly younger than their Defender counterparts. The research results contradict Miles and Snow and Smith et al.'s (1989) findings, which may be a result of the particular characteristics of the development of the Portuguese mould industry.

The analysis also shows (see Table 5H1 in appendix 5H) that the majority of firms (79,4%) experienced difficulties in recruiting the workforce. Respondents were also asked to identify (from strongly disagree-1 to strongly agree-5) the reasons why they experienced difficulties in workforce recruitment. The findings (see Figure 48) revealed that Analysers identified lack of knowledge, lack of necessary experience and lack of personal qualities of applicants. Defenders identified salary expectations as being their prime reason (which is consistent with their emphasis on cost control and efficiency). Prospectors emphasised lack of knowledge (which is consistent with their emphasis on product development, R&D and innovation). These findings are important for

government policy makers, because they clearly show that managers still perceive a shortage of qualified human resources in the market place.

Figure 46 - Strategy types and the number of employees per category, 1996

Strategy Types 96	NMANAGER	NSUPERVI	NTECHNIC	NCLADMIN	NSKILLED	SEMISK	NUNSKILL
Defender	10,7%	4,8%	13,7%	5,7%	39,9%	17,3%	7,8%
Prospector	5,7%	5,9%	9,0%	7,9%	47,5%	16,4%	7,6%
Analyser	10,3%	4,9%	11,3%	6,2%	52,8%	9,7%	4,7%
Reactor	7,4%	6,4%	7,4%	4,3%	58,5%	8,5%	7,4%
Total	8,6%	5,3%	10,8%	6,7%	48,5%	13,6%	6,5%

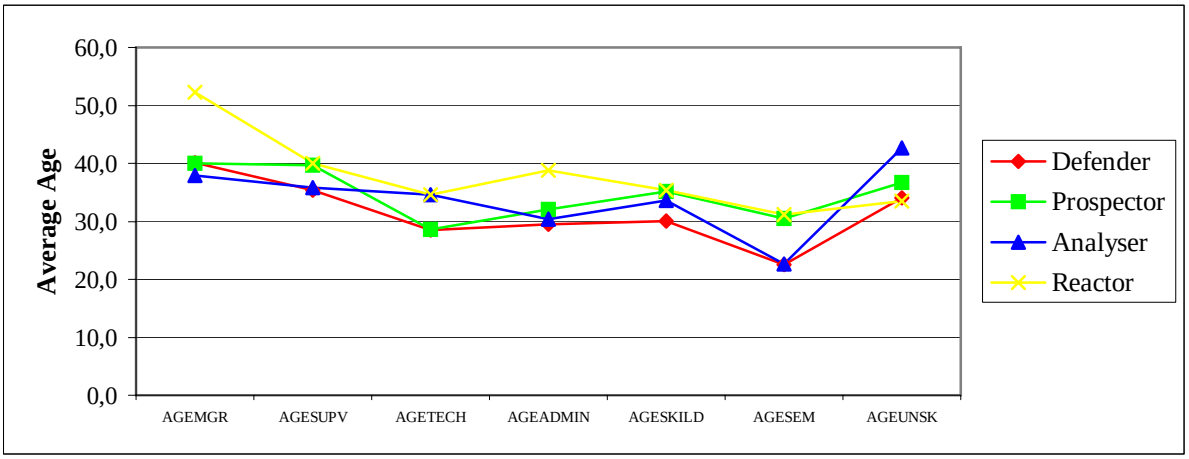


Figure 47 - Strategy types and the average age of employees for each category, 1996

Strategy Types 96	AGEMGR	AGESUPV	AGETECH	AGEADMIN	AGESKILD	AGESEM	AGEUNSK	Average
Defender	40,1	35,4	28,5	29,5	30,0	22,6	34,0	30,1
Prospector	40,0	39,7	28,6	32,1	35,1	30,5	36,7	34,2
Analyser	37,9	35,8	34,6	30,4	33,6	22,6	42,7	33,4
Reactor	52,3	40,0	34,6	38,8	35,4	31,1	33,4	36,5
Total	39,3	37,5	31,2	31,1	33,6	26,3	37,8	33,2

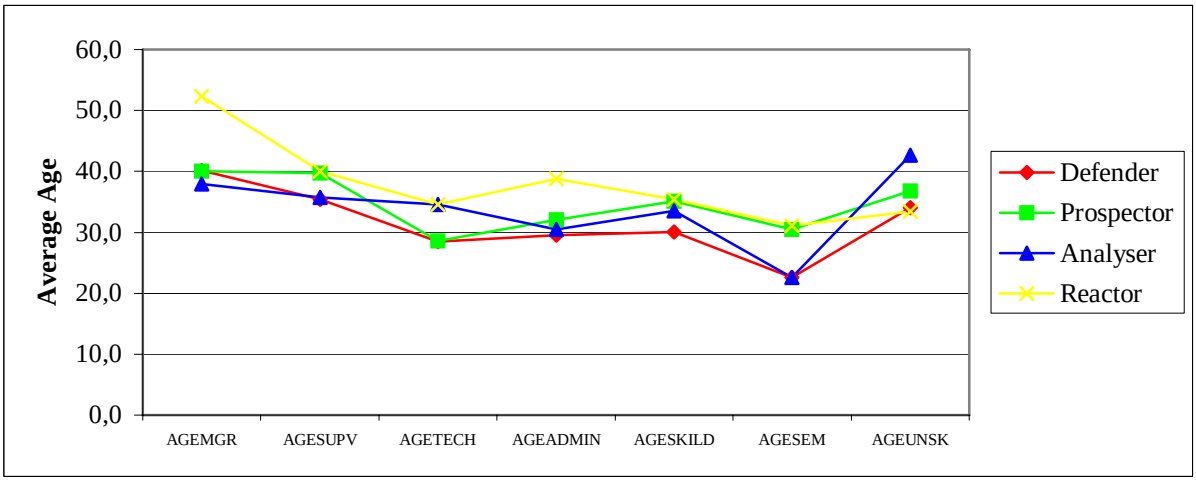
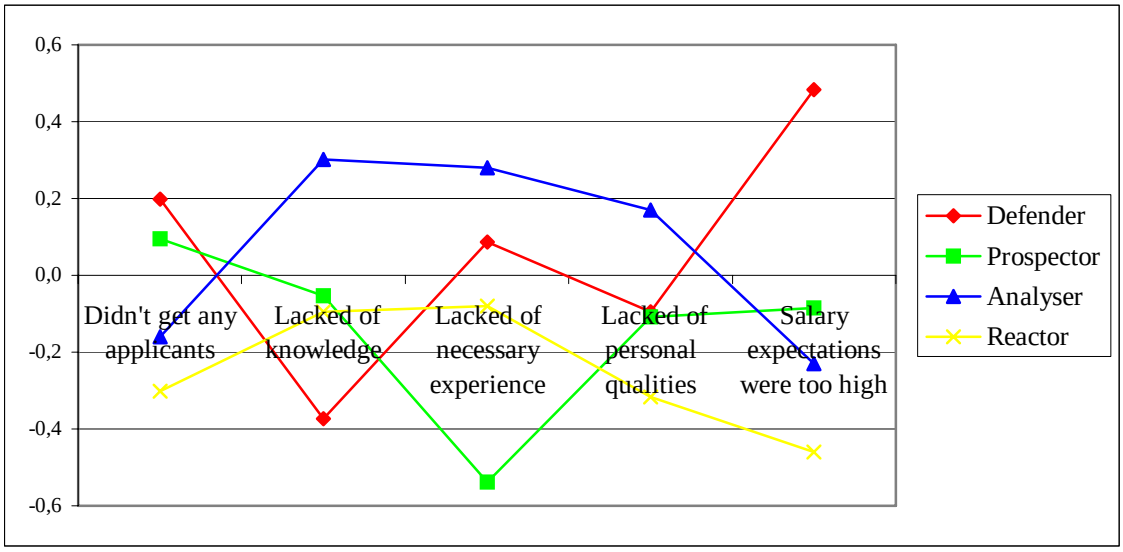


Figure 48 - Means, strategy types and the reasons why firms experience difficulties in workforce recruitment, 1996

Strategy Types 96	Didn't get any applicants	Lacked of knowledge	Lacked of necessary experience	Lacked of personal qualities	Salary Expectations were too high
Defender	2,17	3,06	3,50	2,89	2,94
Prospector	2,06	3,38	2,88	2,88	2,38
Analyser	1,81	3,73	3,69	3,15	2,23
Reactor	1,67	3,33	3,33	2,67	2,00
Total	1,97	3,43	3,41	2,98	2,46

Strategy Types 96	Didn't get any applicants	Lacked of knowledge	Lacked of necessary experience	Lacked of personal qualities	Salary Expectations were too high
Defender	0,2	-0,4	0,1	-0,1	0,5
Prospector	0,1	-0,1	-0,5	-0,1	-0,1
Analyser	-0,2	0,3	0,3	0,2	-0,2
Reactor	-0,3	-0,1	-0,1	-0,3	-0,5



Note: In order to emphasise differences between strategies the total mean was subtracted from the mean of each single strategy type.

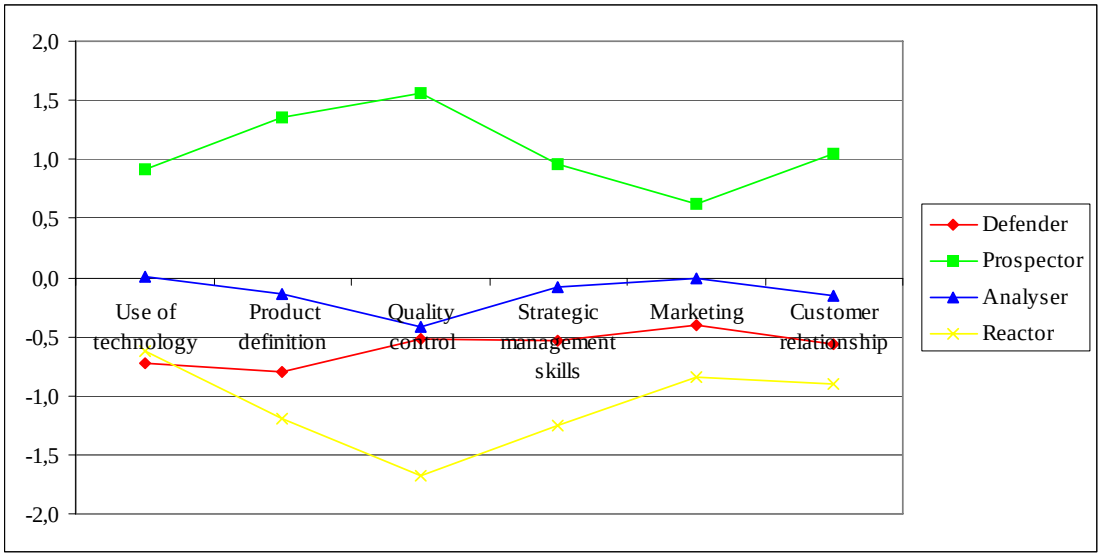
Respondents were also asked to identify whether they had a training policy, what aspects of training were covered, whether employees left their organisation after being trained, and who was responsible for training. The majority of firms (81%) said they had a training policy: all Prospectors, 81% of Analysers and 67% of Defenders replied affirmatively (see Table 5H2 in appendix 5H). Firms paid special attention, first to the use of technology, and then to quality control and product definition. Prospectors placed most emphasis on training, including issues such as strategic management issues, customer relationships and marketing. It is suggested that Prospectors, as large firms,

are more aware of the need to update workers' knowledge and that they are also more willing to invest, because they are aware of the return in the form of higher levels of productivity (Figure 49).

Figure 49 - Means, strategy types and what aspects of training are covered, 1996

Strategy Types 96	Use of technology	Product definition	Quality control	Strategic Management skills	Marketing	Customer relationship
Defender	3,22	1,72	2,17	1,39	1,11	1,00
Prospector	4,88	3,88	4,25	2,88	2,13	2,63
Analyser	3,96	2,38	2,27	1,85	1,50	1,42
Reactor	3,33	1,33	1,00	0,67	0,67	0,67
Total	3,95	2,52	2,68	1,92	1,51	1,57

Strategy Types 96	Use of technology	Product definition	Quality control	Strategic Management skills	Marketing	Customer relationship
Defender	-0,7	-0,8	-0,5	-0,5	-0,4	-0,6
Prospector	0,9	1,4	1,6	1,0	0,6	1,1
Analyser	0,0	-0,1	-0,4	-0,1	0,0	-0,1
Reactor	-0,6	-1,2	-1,7	-1,3	-0,8	-0,9



Note: In order to emphasise differences between strategies the total mean was subtracted from the mean of each single strategy type.

One of the problems that managers pointed to the 80s was the fact that their employees left after training, lured by the high wages offered by competitors. This had serious implications on the industry's development, as firms needed to spend extra time and money on training other individuals, taking the risk that the process would be repeated over and over again. The researcher was therefore interested in knowing whether mould makers still identify this as a problem. Top managers were asked whether their

employees had left their organisation after being trained. The research findings reveal that most firms said that it only happened occasionally (see Figure 50). These findings are important to practitioners, because they indicate that even though there is a shortage of qualified human resources in the market place, this is less of a problem than in the 80s. There is a network of infrastructures, in particular universities and technological organisations such as CENTIMFE and CENFIM that supply the market place with qualified human resources. So the workforce shortage, identified, as being a huge concern of the industry in the 80s, has become less of a problem.

The research also shows that while Defenders identify the government as having prime responsibility for training, Prospectors tended to assume responsibility for training themselves (see Figure 51). In discussion with managers it was suggested that Prospector firms do not want to leave the training responsibility exclusively to the Portuguese institutional system: they think that training must be adapted to their organisational needs. The workforce should be involved in the organisational culture and should adapt to the firm's needs. This is only possible if firms provide the training. As Defenders tend to concentrate their limited resources on the acquisition of technology, they consider that training should be provided by the government. This is an important implication for the government strategy policy development as show the high dependency of Defenders on government for business development.

Figure 50 - Cross-tabulation, strategy types and employees that left their organisation after being trained, 1996

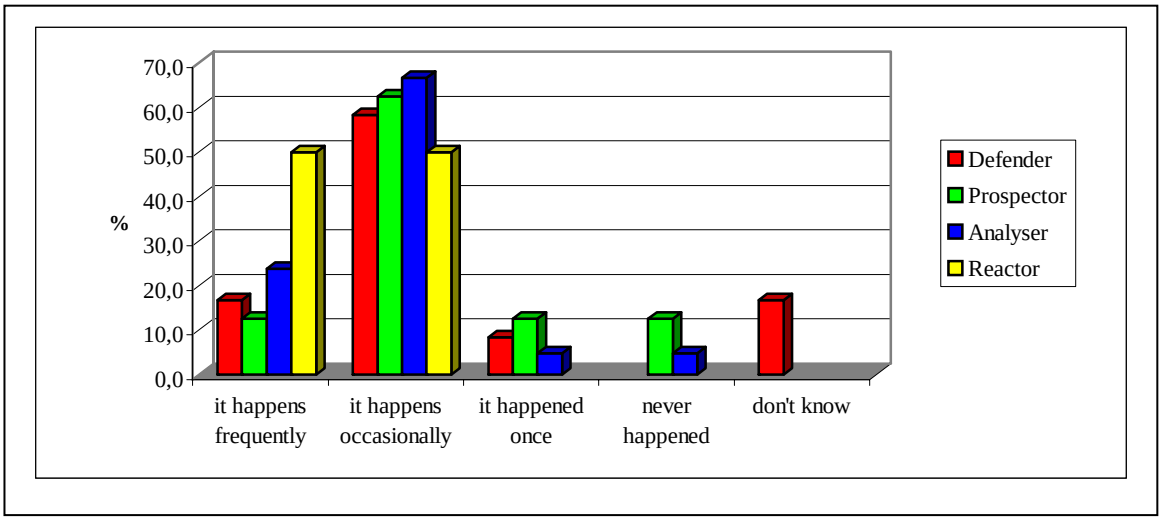
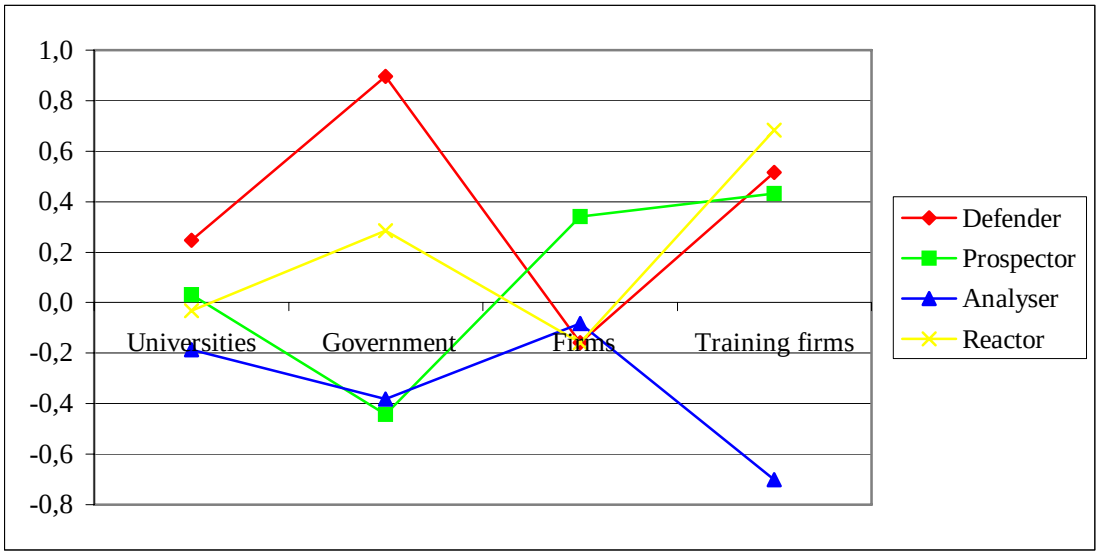


Figure 51 - Means, strategy types and responsibility for training, 1996

Strategy Types 96	Universities	Government	Firms	Training firms
Defender	4,28	4,28	4,00	4,83
Prospector	4,06	2,94	4,50	4,75
Analyser	3,85	3,00	4,08	3,62
Reactor	4,00	3,67	4,00	5,00
Total	4,03	3,38	4,16	4,32

Strategy Types 96	Universities	Government	Firms	Training firms
Defender	0,2	0,9	-0,2	0,5
Prospector	0,0	-0,4	0,3	0,4
Analyser	-0,2	-0,4	-0,1	-0,7
Reactor	0,0	0,3	-0,2	0,7



Note: In order to emphasise differences between strategies the total mean was subtracted from the mean of each single strategy type.

In summary, as far as firm size is concerned, the results show that the industry is composed primarily of medium and large firms. Contrary to expectations, Defenders were mainly small firms (up to 29 employees), Analysers were medium sized firms (between 30-49 employees) and Prospectors were large (between 50-99 employees) and very large firms (more than 100 employees). Reactors were medium firms. The inconsistencies found in the current research findings to Miles and Snow's (1978) strategy type and firm size (Defenders and Prospectors) may be a result of the particular characteristics of the growth of the Portuguese mould industry. Therefore, the current research findings and Smith et al.'s (1989) results contradict Miles and Snow's (1978) view of the relationship between strategy types and firm size.

The analysis reveals that there were no significant differences between strategy types and the number of employees per occupational category. The expected finding that managers of Prospectors would be younger was also not found. These inconsistencies may again be a result of the particular characteristics of the development of the Portuguese mould industry. The analysis also shows that the majority of firms have experienced difficulties in recruiting their workforce. Defenders specified salary expectations as their prime reason, Prospectors specified lack of knowledge and Analysers specified the most reasons. The majority of firms said they had a training policy but Prospectors placed most emphasis on training and focused on issues such as strategic management, customer relations and marketing.

Are there differences in the management of different strategy types?

As suggested by Miles and Snow (1978), Defenders maintain a strict control of firms in order to ensure efficiency. Thus, they have highly specialised and formalised organisation structures. Defenders have a tendency towards functional structure with extensive division of labour and a high degree of formalisation, centralised control and vertical information systems. As a result, Defender organisations may be expected to specify strategic planning, strategy implementation, centralisation organisation structure and quality certification as their organisational management strengths. Prospectors continually modify their product-market domain in order to take advantage of perceived opportunities, so they emphasise flexible administrative systems. Prospectors have a low division of labour, a low degree of formalisation, decentralised control and horizontal information systems. Consequently, Prospectors will perceive decentralisation, innovation and a simultaneous engineering process as their organisational management strengths.

Top managers were asked to identify from a set of organisational management items whether they see them as a strength, a weakness or not applicable. The results show that, contrary to the theoretical expectations, Prospectors identify quality certification (75%), organisation structure (81,3%), strategic management (81,3%), strategic planning (75%), and strategy implementation (50%) as strengths (see Table 12). A possible explanation may lie in the fact that these organisational features are associated

with large firms. As we have seen Prospectors in the Portuguese mould industry have been identified as large firms. As Prospectors are continuously seeking market opportunities, quality certification is very important to winning new customers. New customers understand quality certification as guarantee of quality production. Quality certification is also an expensive process and requires significant resources (both human and financial) to implement; as a result it is accessible mainly to large and medium firms. The deviations from the theory seem to be related to the differences found between the firm size: strategy type assumptions of Miles and Snow and those found in the present study. This seems to indicate that organisational arrangements of firms may be more strongly related to firm size than to strategic positioning.

According to Miles and Snow (1978), Defenders strongly emphasise quality. However, only 44% of Defenders identified quality certification as a strength, 33% considered it a weakness and 22% even said that it was not applicable to their organisations (see Table 12). Defenders are expected to protect their domain by offering higher quality, superior services and lower prices. Yet, as they tend to deal with their customers for long periods of time, quality certification is seen more as a “piece of paper” than as an effective instrument that increases mould quality. In discussion with Defender organisations, managers argued that “quality certification” does not change the current quality of mould production, instead, the process of “quality certification” is bureaucratic and expensive and hence difficult for small firms to afford. The majority of Analysers (54%) identified quality certification as a weakness, which implies that they know the importance of the award, especially in conquering new customers, but they still do not have all the necessary resources to implement the process.
As expected by the theory, Prospectors scored higher on Decentralisation (63%), while Analysers (77%) and Defenders (72%) saw it as not applicable to their organisations (probably due to their smaller size). In contrast, Defenders (50%) and Analysers (46%) identified centralisation as their organisational management strength. Nonetheless, 42% of Analysers acknowledged that centralisation is a weakness in their organisational management. The chi-square tests for centralisation were significantly different: the Pearson chi-square was 0.003. Defender managers, in most cases the owners, centralise every single decision on themselves. Sometimes, when they are away, the firm comes to a halt, since nothing can be decided without their permission. They consider that this is

the best way of controlling the organisation. Prospectors, on the other hand, as large firms, decentralise decision-making to the various departments. In addition, as suggested by the theory, Prospectors identified simultaneous engineering processes and innovation (44% and 81%, respectively) as strengths. Defenders (83%) and Analysers (62%) considered that neither the simultaneous engineering process nor innovation were applicable to them (61% of Defenders and 50% of Analysers).

In summary, as far as organisational management is concerned, the research findings corroborate the administrative dimension of Miles and Snow's typology. As expected by the theory, Prospectors identified decentralisation and Defenders and Analysers identified centralisation as strengths. Also as suggested by the theory, Prospectors identified the simultaneous engineering process and innovation as strengths. Prospectors identified management mainly as a strength. Contrary to the theoretical expectations, however, Prospectors rather than Defenders identified quality certification, organisational structure, strategic management, strategic planning, and strategy implementation as strengths but this can be explained by differences in the relationship between firm size and strategy type. Reactors identified most management items as weaknesses.

Table 12 - Cross-tabulation, strategy types and the organisational management, 1996

Strategy Types 96 * Quality certification

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	8	6	4	18
		% within Strategy Types 96	44,4%	33,3%	22,2%	100,0%
	Prospector	Count	12	3	1	16
		% within Strategy Types 96	75,0%	18,8%	6,3%	100,0%
	Analyser	Count	9	14	3	26
		% within Strategy Types 96	34,6%	53,8%	11,5%	100,0%
	Reactor	Count		2	1	3
		% within Strategy Types 96		66,7%	33,3%	100,0%
Total		Count	29	25	9	63
		% within Strategy Types 96	46,0%	39,7%	14,3%	100,0%

Strategy Types 96 * Organisation structure

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	9	7	2	18
		% within Strategy Types 96	50,0%	38,9%	11,1%	100,0%
	Prospector	Count	13	3		16
		% within Strategy Types 96	81,3%	18,8%		100,0%
	Analyser	Count	12	11	3	26
		% within Strategy Types 96	46,2%	42,3%	11,5%	100,0%
	Reactor	Count		2	1	3
		% within Strategy Types 96		66,7%	33,3%	100,0%
Total		Count	34	23	6	63
		% within Strategy Types 96	54,0%	36,5%	9,5%	100,0%

Strategy Types 96 * Strategic management

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	10	3	5	18
		% within Strategy Types 96	55,6%	16,7%	27,8%	100,0%
	Prospector	Count	13	3		16
		% within Strategy Types 96	81,3%	18,8%		100,0%
	Analyser	Count	14	8	4	26
		% within Strategy Types 96	53,8%	30,8%	15,4%	100,0%
	Reactor	Count		2	1	3
		% within Strategy Types 96		66,7%	33,3%	100,0%
Total		Count	37	16	10	63
		% within Strategy Types 96	58,7%	25,4%	15,9%	100,0%

Table 12 Cont. - Cross-tabulation, strategy types and the organisational management, 1996.

Strategy Types 96 * Strategic planning

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	5	3	10	18
		% within Strategy Types 96	27,8%	16,7%	55,6%	100,0%
	Prospector	Count	12	3	1	16
		% within Strategy Types 96	75,0%	18,8%	6,3%	100,0%
	Analyser	Count	11	7	8	26
		% within Strategy Types 96	42,3%	26,9%	30,8%	100,0%
	Reactor	Count		2	1	3
		% within Strategy Types 96		66,7%	33,3%	100,0%
Total		Count	28	15	20	63
		% within Strategy Types 96	44,4%	23,8%	31,7%	100,0%

Strategy Types 96 * Strategy implementation

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	5	3	10	18
		% within Strategy Types 96	27,8%	16,7%	55,6%	100,0%
	Prospector	Count	8	4	4	16
		% within Strategy Types 96	50,0%	25,0%	25,0%	100,0%
	Analyser	Count	8	9	9	26
		% within Strategy Types 96	30,8%	34,6%	34,6%	100,0%
	Reactor	Count		2	1	3
		% within Strategy Types 96		66,7%	33,3%	100,0%
Total		Count	21	18	24	63
		% within Strategy Types 96	33,3%	28,6%	38,1%	100,0%

Strategy Types 96 * Information feedback

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	14	2	2	18
		% within Strategy Types 96	77,8%	11,1%	11,1%	100,0%
	Prospector	Count	9	5	2	16
		% within Strategy Types 96	56,3%	31,3%	12,5%	100,0%
	Analyser	Count	21	4	1	26
		% within Strategy Types 96	80,8%	15,4%	3,8%	100,0%
	Reactor	Count	2	1		3
		% within Strategy Types 96	66,7%	33,3%		100,0%
Total		Count	46	12	5	63
		% within Strategy Types 96	73,0%	19,0%	7,9%	100,0%

Table 12 Cont. - Cross-tabulation, strategy types and the organisational management, 1996.

Strategy Types 96 * Centralisation

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	5	5	4	18
		% within Strategy Types 96	50,0%	27,8%	22,2%	100,0%
	Prospector	Count	2	3	11	16
		% within Strategy Types 96	12,5%	18,8%	68,8%	100,0%
	Analyser	Count	12	11	3	26
		% within Strategy Types 96	46,2%	42,3%	11,5%	100,0%
	Reactor	Count	1	2		3
		% within Strategy Types 96	33,3%	66,7%		100,0%
Total		Count	24	21	18	63
		% within Strategy Types 96	38,1%	33,3%	28,6%	100,0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19,489[a]	6	,003
Likelihood Ratio	19,385	6	,004
Linear-by-Linear Association	1,902	1	,168
N of Valid Cases	63		

a. 4 cells (33,3%) have expected count less than 5. The minimum expected count is ,86.

Strategy Types 96 * Decentralisation

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	4	1	13	18
		% within Strategy Types 96	22,2%	5,6%	72,2%	100,0%
	Prospector	Count	10		6	16
		% within Strategy Types 96	62,5%		37,5%	100,0%
	Analyser	Count	4	2	20	26
		% within Strategy Types 96	15,4%	7,7%	76,9%	100,0%
	Reactor	Count			3	3
		% within Strategy Types 96			100,0%	100,0%
Total		Count	18	3	42	63
		% within Strategy Types 96	28,6%	4,8%	66,7%	100,0%

Table 12 Cont. - Cross-tabulation, strategy types and the organisational management, 1996.

Strategy Types 96 * Simultaneous engineer process

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	2	1	15	18
		% within Strategy Types 96	11,1%	5,6%	83,3%	100,0%
	Prospector	Count	7	3	6	16
		% within Strategy Types 96	43,8%	18,8%	37,5%	100,0%
	Analyser	Count	3	7	6	26
		% within Strategy Types 96	11,5%	26,9%	61,5%	100,0%
	Reactor	Count			3	3
		% within Strategy Types 96			100,0%	100,0%
Total		Count	12	11	40	63
		% within Strategy Types 96	19,0%	17,5%	63,5%	100,0%

Strategy Types 96 * Innovation

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	6	1	11	18
		% within Strategy Types 96	33,3%	5,6%	61,1%	100,0%
	Prospector	Count	13	1	2	16
		% within Strategy Types 96	81,3%	6,3%	12,5%	100,0%
	Analyser	Count	8	5	13	26
		% within Strategy Types 96	30,8%	19,2%	50,0%	100,0%
	Reactor	Count	1		2	3
		% within Strategy Types 96	33,3%		66,7%	100,0%
Total		Count	28	7	28	63
		% within Strategy Types 96	44,4%	11,1%	44,4%	100,0%

Strategy Types 96 * Succession

Cross tab

			Strength	Weakness	Not applicable	Total
Strategy Types 96	Defender	Count	3	7	8	18
		% within Strategy Types 96	16,7%	38,9%	44,4%	100,0%
	Prospector	Count	7	4	5	16
		% within Strategy Types 96	43,8%	25,0%	31,3%	100,0%
	Analyser	Count	4	8	14	26
		% within Strategy Types 96	15,4%	30,8%	53,8%	100,0%
	Reactor	Count		2	1	3
		% within Strategy Types 96		66,7%	33,3%	100,0%
Total		Count	14	21	28	63
		% within Strategy Types 96	22,2%	33,3%	44,4%	100,0%

The differences between strategy types and organisational internal resources and competences have been analysed. However, an analysis of the differences between

strategy types and organisations' external environments is also important. The next research aim, therefore, is to explore the differences between strategy types and the firms' external environment: the organisations' customers (the benefits offered), competitors (who and where they are located), suppliers (subcontracting policy) and environmental trends (the firms' opportunities and threats).

The organisation's external environment

According to the theory, Defenders tend to offer a more limited range of products or services than their competitors and they attempt to protect their domain by offering higher quality, superior service and lower prices. They tend to ignore changes in the industry that have no direct influence on current areas of operation and they concentrate instead on doing the best job possible in a limited area. Prospectors value being "first movers" in new product and market areas even if not all of these efforts prove to be profitable. The organisation responds rapidly to early signs of areas of opportunity and these responses often lead to a new round of competitive actions.

Defenders, therefore, are expected to offer low prices, high quality, short delivery times and high technology expertise as a customer benefit. As Defenders do not seek new areas of opportunities or innovation, they will state that their competitors will be mainly located in the national market and that they do something different and unique, that they innovate, offer a varied range of services, emphasise marketing policy and offer a simultaneous engineering process. Regarding supply policy, Defenders will subcontract mould testing (as it is not their core technology). They will subcontract mainly because they do not own the technology and the service or product is casual. They subcontract to national mould companies and other sectors. Defenders will identify intermediary-trade firms as a threat, and government support as not applicable.

Prospectors will offer innovation, something different and unique, a varied range of services and post-sales support as a benefit to their customers. They will have recent as well as long-term customers. Prospectors will identify competition as being mainly from abroad; they will identify Italian, French, German, American, Far East Asia and Eastern European mould makers as their competitors. They recognize that their

competitors will not do anything significantly better than them. They will subcontract mainly complete moulds or parts of the mould because this is profitable. They subcontract mainly to associate firms. Prospectors will identify Eastern European countries as a threat, and new markets as an opportunity. Defenders will identify intermediary-trading firms as a threat, associateship as an opportunity and government support as not applicable; Analysers will occupy an intermediate position between Defenders and Prospectors. Reactors will have no distinctive competences; they will not show a consistent pattern.

Are there differences between strategy types in the benefits offered to customers?

In order to understand the relationship between Portuguese mould makers and their customers, firms were asked to identify what benefits they offered to their customers (using a scale ranging from 1 (strongly disagree) to 5 (strongly agree). They were also asked how long they had been dealing with their existing customer base. The analysis reveals that for 1980-97, strategy types changed the benefits they offered to their customers (see Figure 52, and for further details see also appendix 5J). Firms increased the benefits offered (e.g. they have been offering better quality, delivery times, more competitive prices, technological expertise). There were no significant differences between strategy types and quality, delivery times, price, technological expertise, trust and customer relationship. Hambrick (1983) tested price, quality and service as competitive devices (i.e. he also investigated whether Defenders had lower prices, provided better service and better quality than Prospectors). His results revealed that Defenders offered better average service than Prospectors but no differences were found in price and quality. Slater and Narver (1993) also showed that Defenders primarily based their competitive advantage on low cost.

Analysers in 1980-86 offered most benefits. However, in the subsequent periods (1987-92) Analysers' differences became less evident. From 1987-1992 onwards (in 1993-1995, 1996 and 1997) Prospectors distinctively scored higher on most of the benefits offered to customers. Prospectors not only increased significantly the benefits offered to their customers, but, as expected, they scored higher for all timescales than any other strategic group on innovation. Consistent with the theory, Prospectors also emphasised

doing something different and unique and post-sales support. According to Miles and Snow (1978), Prospectors are leading edge firms; they value being “first ” in new products and markets so, it was expected that they would emphasise innovation. They also constantly seek new opportunities, so it was expected that one of the benefits offered to their customers would be doing something different and unique. It is also interesting to see that Prospectors have over time emphasised a varied range of services. This indicates that they have systematically moved their position in the value chain - both upstream and downstream. Defenders, as expected, did not significantly change the benefits offered to their customers and maintained a relatively stable position. They have always emphasised customer relationships but in 1996 and 1997 that leadership became less evident perhaps as markets became more unstable, competitive and volatile. Defenders also offered technological expertise and that was reinforced especially in 1996 and 1997. As suggested by the theory, Defenders maintain a secure market niche by pursuing and persisting with what they think they are good at. Reactors were for all timescales the strategic group that paid little attention to the benefits they offered and they offered fewer benefits than any other strategic type. Despite having survived, Reactors seem less able to face and respond to environmental challenges. One Reactor manager said that they were prepared to cease trading following the death of the firm’s owner. After experiencing some difficulties, the lack of leadership brought the mould firm to an end.

Also in the context of the analysis of the firms’ customers, Portuguese mould makers were asked what was their average length of time of dealing with their customers. The results illustrate (see Figure 53) that most firms (57%) had been dealing with their customers for 5 to 10 years, followed by a smaller group that had been dealing with them for over 10 years (49%). Defenders had been dealing with their customers mainly for 5-10 years (78%), and Prospectors for over 10 years (56%). These findings are important because they show that Portuguese mould makers tend to establish long-term relationships with their customers and that they value long-term relationships with they customers.

Figure 52 - Means, strategy types and the benefits offered to customers, 1980-97

Figure 52A - The benefits offered to customers, 1980-86

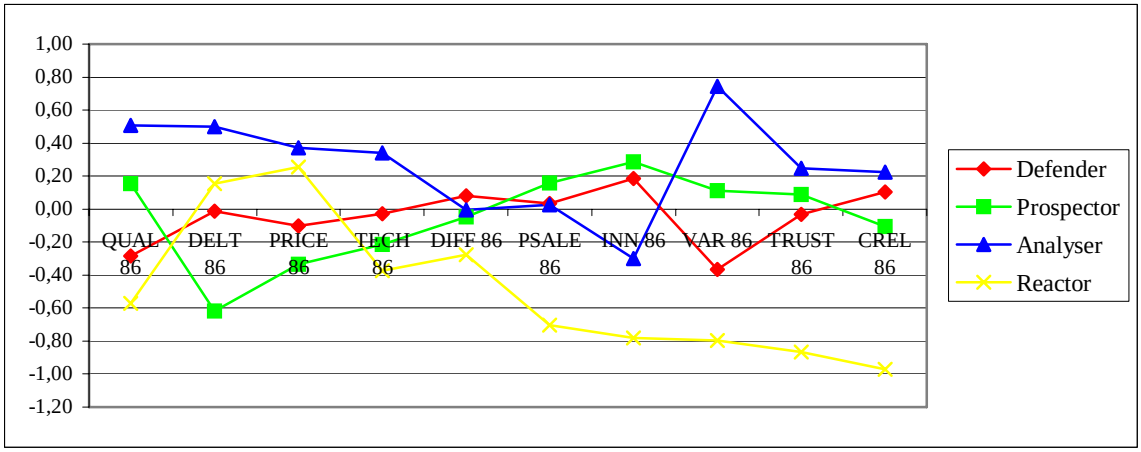


Figure 52B - The benefits offered to customers, 1987-92

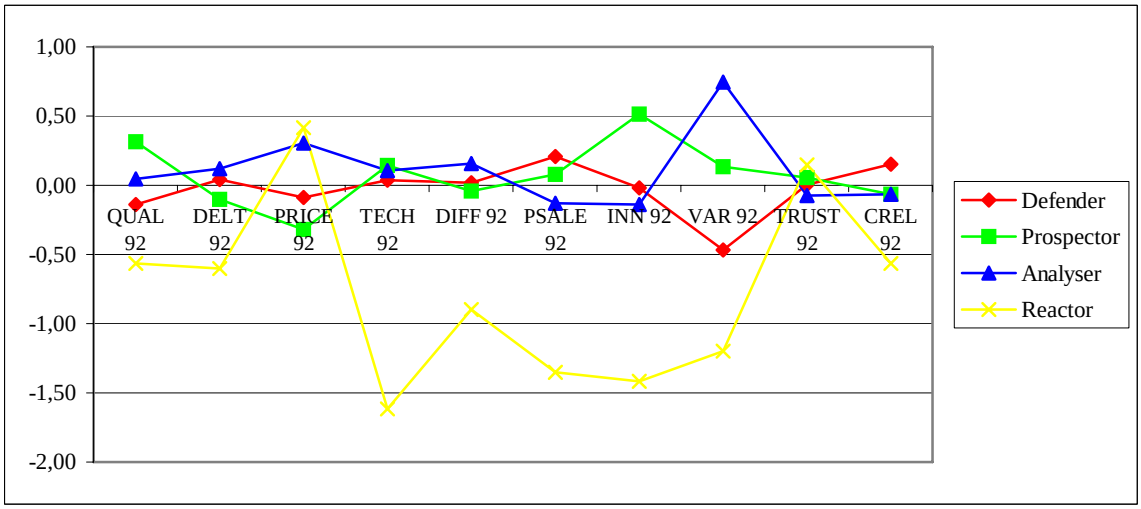


Figure 52C - The benefits offered to customers, 1993-95

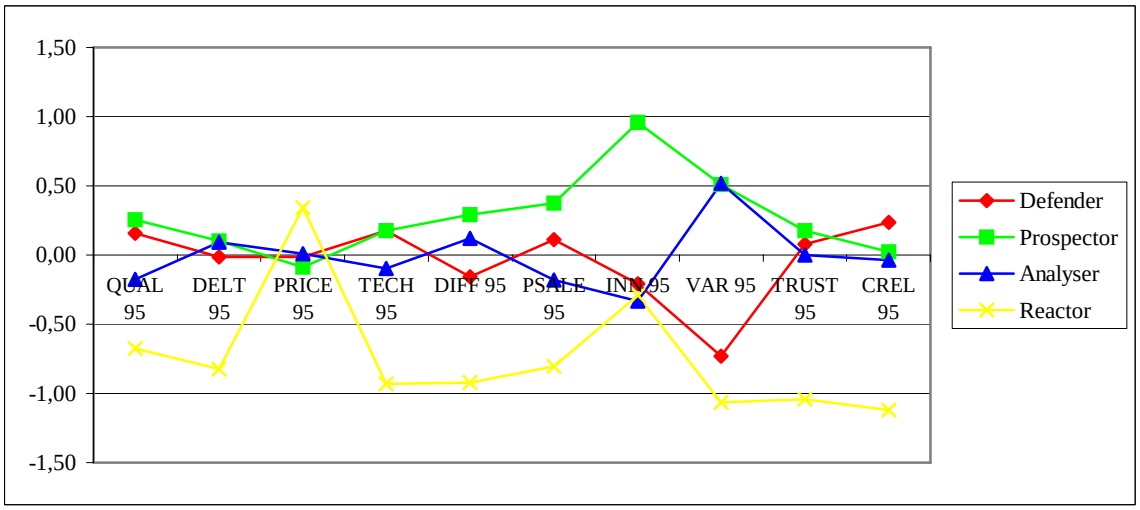


Figure 52 Cont. - Means, strategy types and the benefits offered to customers, 1980-97

Figure 52D - The benefits offered to customers, 1996

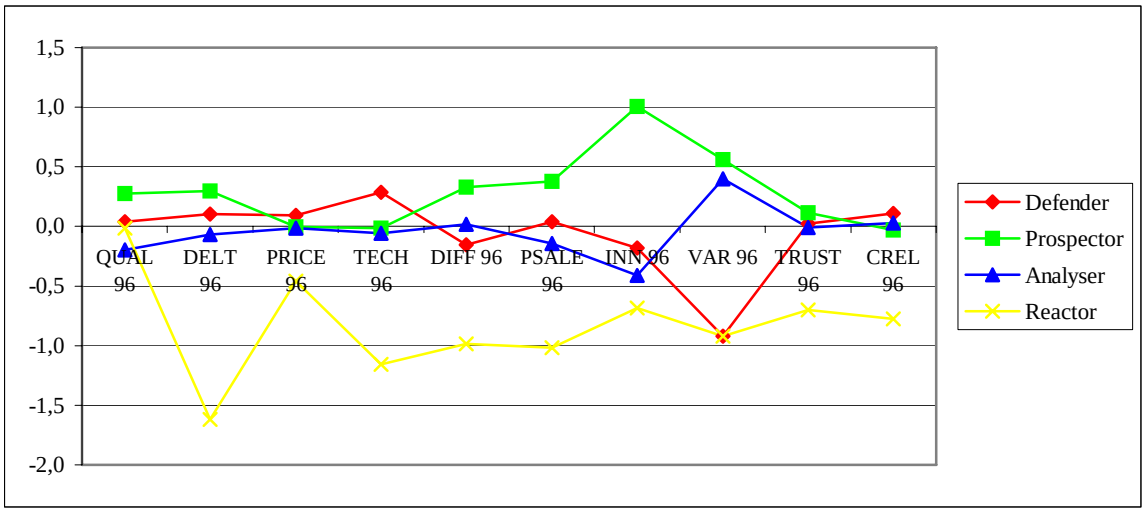
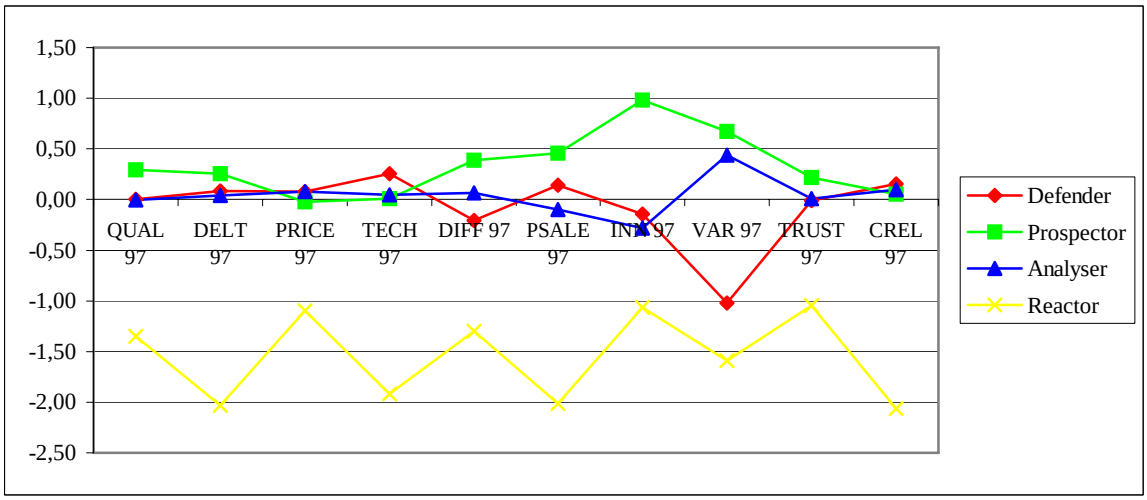


Figure 52E - The benefits offered to customers, 1997

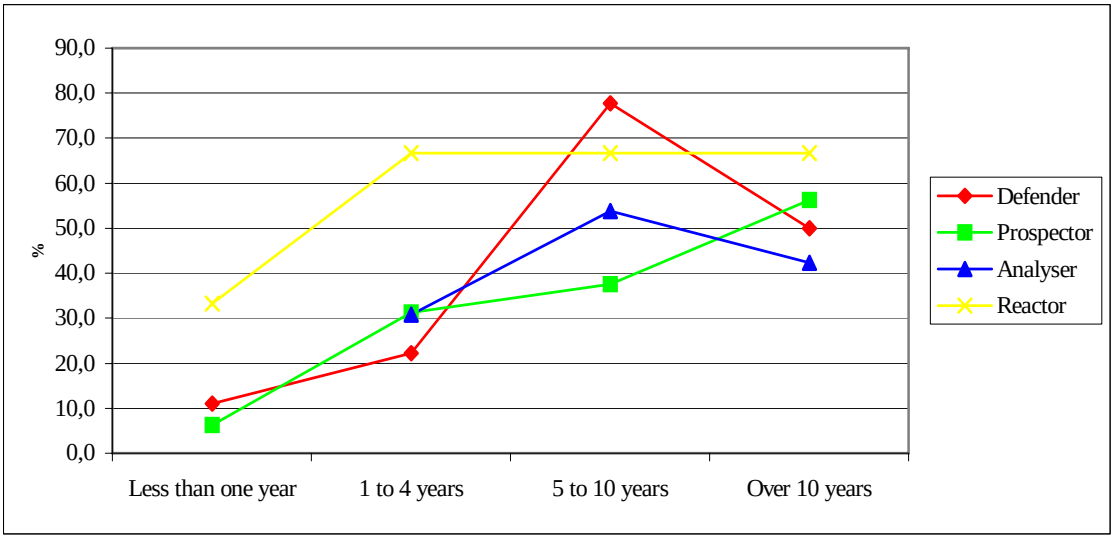


Note: In order to emphasise differences between strategies the total mean was subtracted from the mean of each single strategy type.

Figure 53 - Strategy types and the average length of time that firms are dealing with customers, 1996

Strategy Types 96 * Average length of time of dealing with customers% within Strategy Types 96 Cross-tabulation

Strategy Types 96	Less than one year	1 to 4 years	5 to 10 years	Over 10 years
Defender	11,1%	22,2%	77,8%	50,0%
Prospector	6,3%%	31,3%	37,5%	56,3%
Analyser		30,8%	53,8%	42,3%
Reactor	33,3%	66,7%	66,7%	66,7%
Total	6,3%	30,2%	57,1%	49,2%



In summary, with respect to the analysis of firms' customer relationships, the current research findings illustrate that firms increased the benefits offered to their customers over the timescales; they offered better quality, shorter delivery times, more competitive prices, greater technological expertise (which may be a consequence of their know-how and accumulated experience), greater post-sales support, trust and customer relationship. From 1987-1992 onwards: in 1993-1995, 1996 and 1997, Prospectors scored more highly in most of the benefits offered to customers. The findings conform to the theoretical expectations: Prospectors emphasise innovation, doing something different and unique and post-sales support. However, there were no significant differences between strategy types and the quality, delivery times, the price, technological expertise, trust and customer relationship, benefits offered. The research findings corroborate Hambrick's (1983) results.

Having analysed the differences between strategy types and customer relationships the next objective is to identify differences between strategy types and the organisation's competition.

Are there differences in the competition of different strategy types?

Respondents were asked to identify where their main competition was located, and what their competitors were doing better than them. The findings demonstrate (see Figure 54 and for more details see appendix 5K) that firms primarily identified their competition as being located in the National market (75 %), Italy (62%), in the Far East (60%) and Germany (48%). Defenders said that their competition is overwhelmingly located in the Portuguese market. Defenders do not tend to seek for their own customers, they depend mainly on intermediary-trade firms to sell overseas, so they identify their competition as being more locally. Prospectors identified their competition as being located primarily in Italy (75%). Prospectors were also more likely to acknowledge competition from the French (38%) and American-Canadian market (38%). As Prospectors sell mainly to the automobile industry, it is not surprising that they face competition in the French market given that their main customers are Renault and Peugeot. In terms of total sales, the French market is the fourth most important market for Prospectors. As a result they may compete with the French mould makers. The American market is the second most important market for Prospectors. The American market is strong for domestic appliances, electric/electronic and "other" (packaging, medical, civil construction) industries, which are Prospectors' main clients.

Analysers identified Far East mould makers as their prime competitors (69%). Prospectors also identified competition from the Far East. Taiwanese mould makers have learnt quickly the art of crafting the steel. As suggested by one manager:

> "(The Taiwanese) are producing with the same quality standards as we do, sometimes even with shorter mould deliveries, and of course their prices are more competitive than ours. Therefore, customers especially from the USA, are beginning to swap Portuguese moulds for Taiwanese ones".

The benchmark study conducted by Dan Elliot, a procurement engineer for Hewlett-Packard, and Dan Furlano, a technical manger at General Electric plastics, concluded that the price differential springs from low labour costs, in which Taiwan, China and Korea present the lowest values (Ogando, 1998). In discussion with managers, it was mentioned that Italian and Taiwanese mould makers compete with them in price and/or delivery time. Portuguese, Hong Kong and Chinese mould makers compete in price. Italian, German, and French mould makers compete on delivery time. It is interesting to note that Reactors identified their competition as being located exclusively in the national market. For Prospectors, competition was most widespread, as they continuously seek new market opportunities. They are also more aware of their threats.

Respondents were also asked to identify rated from 1 for (strongly disagree) to 5 (strongly agree) what their competitors were doing better than them. The findings show (Figure 55) that firms tended to acknowledge that competitors are doing better than them on simultaneous engineering, price, marketing and delivery time but not customer relationships, trust, innovation, post-sales support, quality or doing something different and unique. As expected, Defenders recognised that their Prospector counterparts were doing marketing better than them. As seen previously, Defenders depend primarily on intermediary-trading firms to sell overseas, so it was likely that they would realise that their competitors do better than them in marketing. Prospectors perceived that in marketing their competitors do not do better than them. As suggested by the theory, Prospectors are strongly marketing-orientated. Analysers indicated that their competitors were doing better on simultaneous engineering process. As mentioned earlier, Prospectors have enlarged their value chain backwards on product-definition and product-prototyping, which are the constituent phases of simultaneous engineering process (also known as concurrent engineering). Analysers are, thus, aware that Prospectors are better in this area.

Prospectors did not identify any item on which they thought their counterparts were doing something significantly better than them (Figure 55). Prospectors, as large firms, have easy access to resources (e.g. human, financial, material, etc.) and, as a result, they identify fewer constraints. Indeed, it is there firms that create barriers to entry in the market place. Reactors, as expected, perceived that the competition is much better than

them. It is important to emphasise that Portuguese mould makers did not score the competition items above 3. This means that either they do not know that the competition is really doing better than them, or that they know and they perceive that nothing is significantly better.

Figure 54 - Cross-tabulation, strategy types and the location of competition, 1996

Strategy types 96	National Market	German	Italian	French	British	Spanish	American and Canadian	Far East Asia	Eastern Europe	Other Markets
Defender	83,3%	55,6%	61,1%	16,7%	22,2%	16,7%	11,1%	50,0%	22,2%	22,2%
Prospector	68,8%	50,0%	75,0%	37,5%		12,5%	37,5%	62,5%	31,3%	25,0%
Analyser	69,2%	46,2%	57,7%	7,7%	7,7%	3,8%	7,7%	69,2%	34,6%	11,5%
Reactor	100,0%		33,3%					33,3%	33,3%	
Total	74,6%	47,6%	61,9%	17,5%	9,5%	9,5%	15,9%	60,3%	30,2%	17%

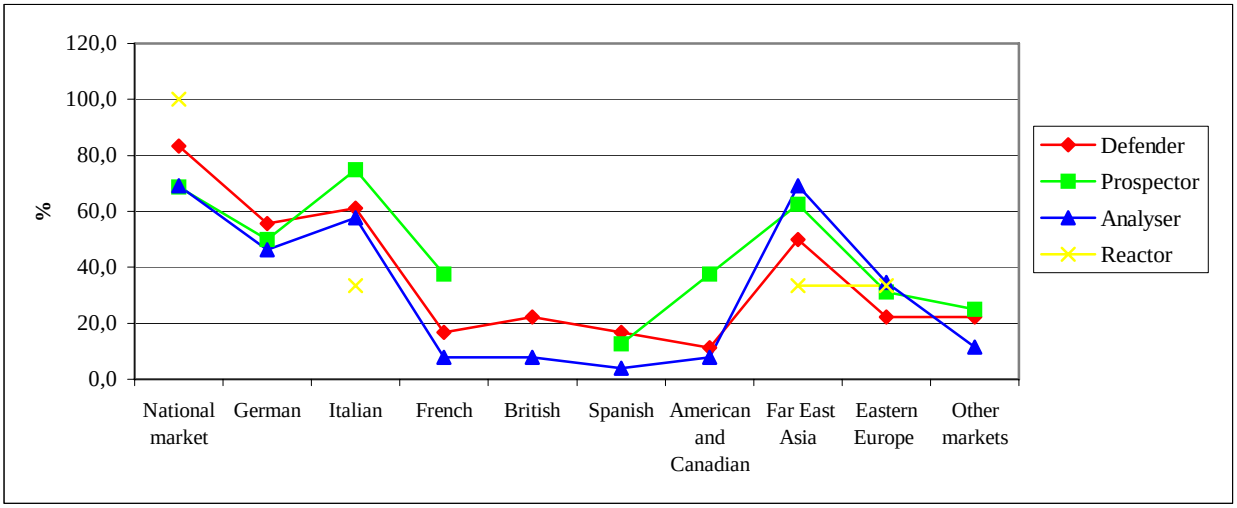
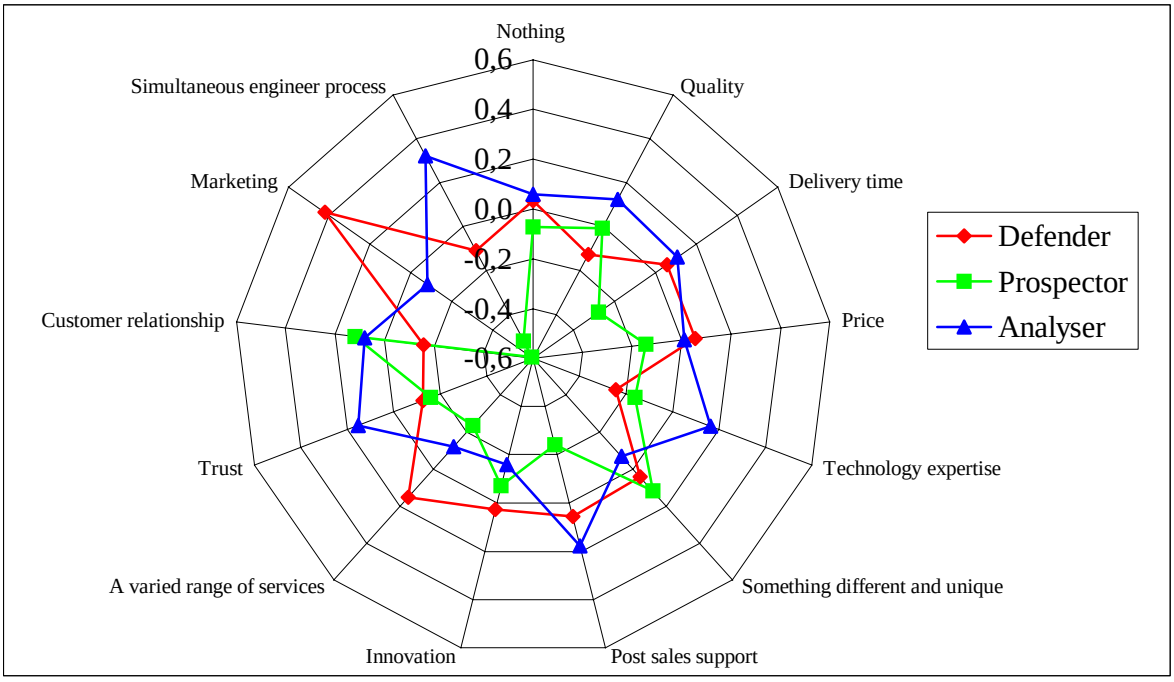


Figure 55 - Means, strategy types and the dimensions in which competition is doing better than the Portuguese mould makers, 1996

Strategy Types 96	Nothing	Quality	Delivery Time	Price	Technology Expertise	Something different and unique	Post sales support	Innovation	A varied range of services	Trust	Customer relationship	Marketing	Simultaneous engineer process
Defender	2,67	1,44	2,83	3,39	2,17	1,61	1,61	1,72	2,39	1,22	1,22	3,39	3,22
Prospector	2,56	1,56	2,50	3,19	2,25	1,69	1,31	1,63	2,00	1,19	1,50	2,38	2,81
Analyser	2,69	1,69	2,88	3,35	2,58	1,50	1,73	1,54	2,12	1,50	1,46	2,88	3,65
Reactor	2,33	1,33	3,00	3,67	3,33	1,33	1,00	3,33	3,67	1,67	1,00	4,33	4,00
Total	2,63	1,57	2,78	3,33	2,41	1,57	1,56	1,70	2,24	1,35	1,38	2,97	3,33

Strategy Types 96	Nothing	Quality	Delivery time	Price	Technology expertise	Something different and unique	Post sales support	Innovation	A varied range of services	Trust	Customer relationship	Marketing	Simultaneous engineer process
Defender	0,03	-0,13	0,06	0,06	-0,25	0,04	0,06	0,02	0,15	-0,13	-0,16	0,42	-0,11
Prospector	-0,07	-0,01	-0,28	-0,15	-0,16	0,12	-0,24	-0,07	-0,24	-0,16	0,12	-0,59	-0,52
Analyser	0,06	0,12	0,11	0,01	0,16	-0,07	0,18	-0,16	-0,12	0,15	0,08	-0,08	0,32
Reactor	-0,30	-0,24	0,22	0,33	0,92	-0,24	-0,56	1,63	1,43	0,32	-0,38	1,37	0,67
Total	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00



Note: In order to emphasise differences between strategies, the total mean was subtracted from the mean of each single strategy type.

In summary, there are significant differences between strategy types and the location of competition. Defenders identified their competition as being located primarily in Portugal while Prospectors perceive that their competition is more widely located. The location of competition (as seen previously in Chapter 3) is associated with the factors in which they are competing: Defenders in Portugal mainly compete on price, and Analysers and Prospectors on price and delivery time. The standards of quality

required by customers (especially multinational firms) are exhaustively described; all firms are potential suppliers if they respect the quality requisites imposed by customers. So quality is not an issue. Firms recognised that the competition was doing better than them on simultaneous engineering process, price, marketing and delivery time, although not significantly better. Defenders recognised that their counterparts were doing marketing better than them. As expected, Prospectors scored lower on marketing. Analysers indicated that their competitors were doing the simultaneous engineering process better. Prospectors as a whole did not identify any item in which their counterparts were doing something significantly better. Reactors, as expected, identified more items in which the competition was better.

Having analysed the differences between strategy types and their competition, the next objective is to identify differences between strategy types and the organisation's subcontracting policy.

Are there differences in the subcontracting policy of different strategy types?

Respondents were asked to identify whether they subcontract, what they subcontract, why they subcontract and to whom. The findings show that all firms subcontract. It is suggested that firms subcontract because it confers flexibility: a) they do not need to make heavy investments in multiple technology; b) they can accept more mould orders than their real technological capacity; and c) it can be cheaper to subcontract. Firms perceived that resorting more often to specialised services is a way of using their resources more effectively, as it can work out cheaper and they can focus their resources on what they think is really important (e.g. the acquisition of core technologies or seeking customers). In aggregate the analysis (see Figure 56 and for more details see also appendix 5L) indicates that firms primarily subcontracted mould testing and parts of the mould (sub-component production). It is also interesting to note that the subcontracting of complete moulds has increased over time. In 1980-86, firms spent an average of 9% of their total subcontracting on complete moulds and in 1997, this value increased to 12%. Subcontracting complete moulds allows firms to guarantee customer orders, even when they know that they are overloaded.

Among strategy types, Defenders most subcontracted product definition-product design, product definition-prototyping and parts of the mould. Defenders, as small firms, do not own all the technology (e.g. prototyping), so they subcontract specific tasks/services in order to increase customers' added valued and firms' competitiveness. Defenders may be also overloaded and therefore subcontract parts of the manufactured mould. It is interesting to see that even if Defenders do not own the technology, they can subcontract it to increase their competitiveness. Defenders try to overcome the shortage of financial resources by subcontracting the technological and manufacturing tasks, which they cannot afford or which will be cheaper to give to others to do. The subcontracting policy in the Portuguese mould industry, through the specialisation of firms, is one way for small firms to become more competitive. Prospectors subcontract mainly complete moulds and assembly work. It is suggested that it is more profitable for Prospectors (as large firms) to subcontract the complete mould (small and medium dimensions) than to manufacture it themselves - essentially as this does not constitute their core business. It is understandable that as they tend to enlarge their value chain, whether moving backwards or forwards, they subcontract other firms to assemble the plastic pieces.

As expected, Defenders maintained over the periods a fairly stable trend of what they were subcontracting. Also as expected, Prospectors most changed their subcontracting policy. Contrary to the theoretical expectations, Analysers showed a relatively steady trend. Analysers, as suggested, should change their strategic pattern more than Defenders and less than Prospectors. Reactors emphasised different subcontracting tasks at different periods of time (see Table and Figure 5L4 in appendix 5L).

Figure 56 - Means, strategy types and what firms subcontract, 1980-97

Figure 56A - The mould manufactured tasks subcontracted, 1980-86

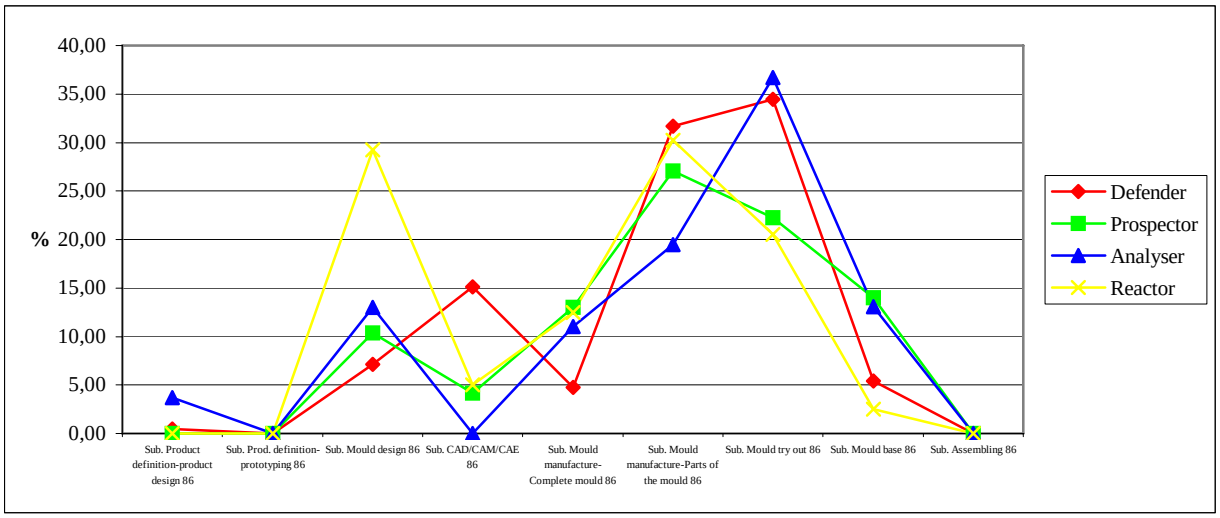


Figure 56B - The mould manufactured tasks subcontracted, 1987-92

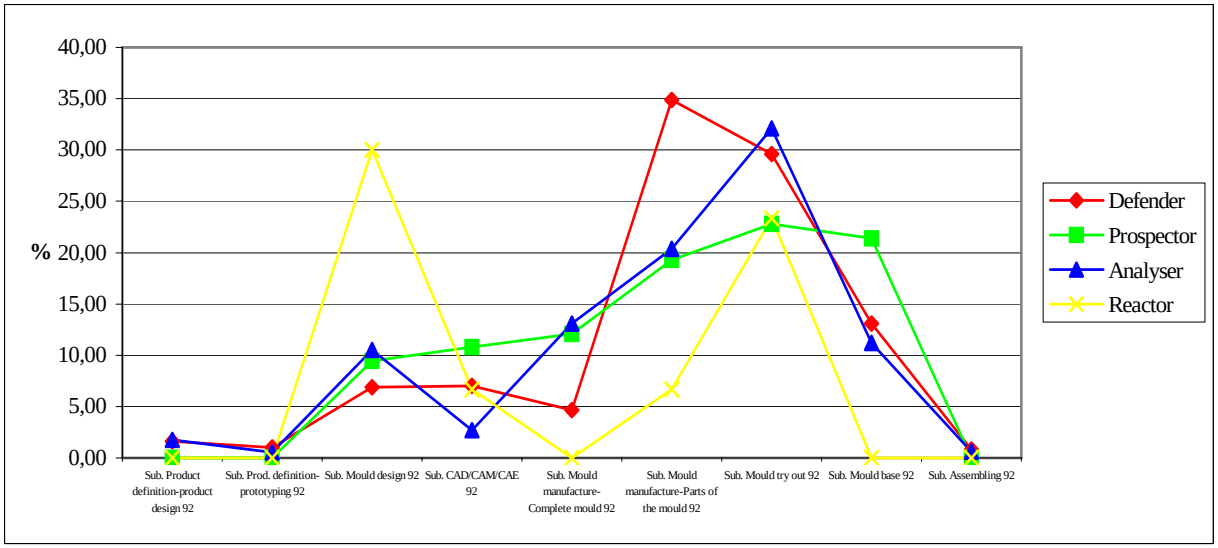


Figure 56C - The mould manufactured tasks subcontracted, 1993-95

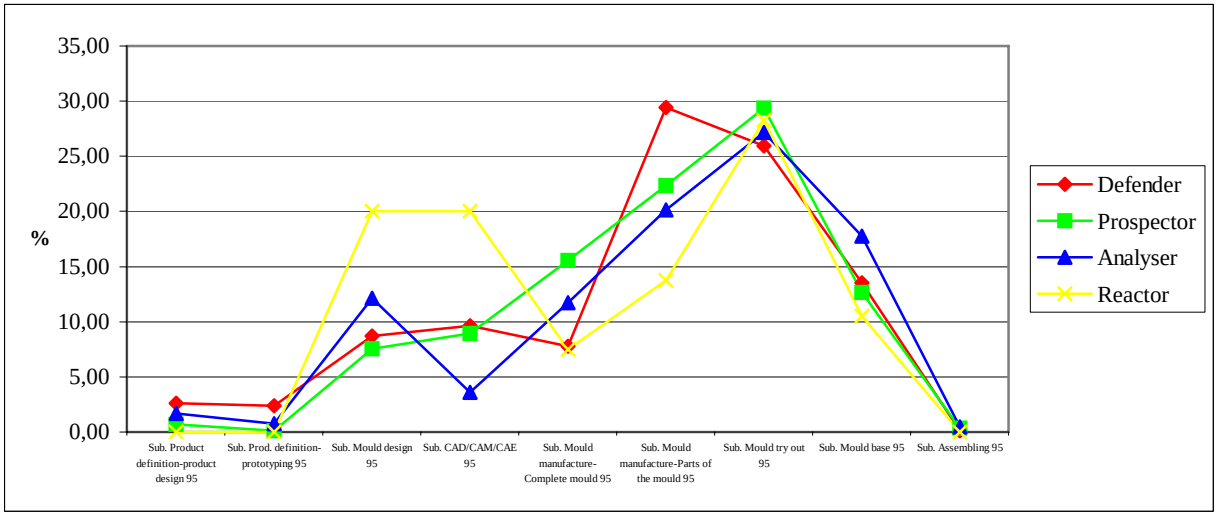


Figure 56 Cont. - Means, strategy types and what firms subcontract, 1980-97

Figure 56D - The mould manufactured tasks subcontracted, 1996

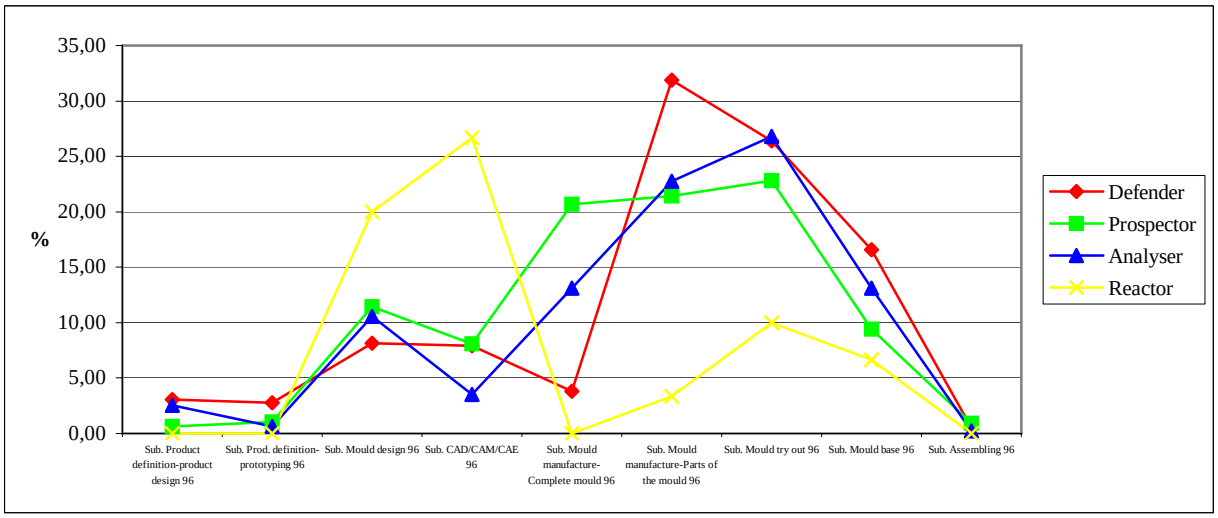
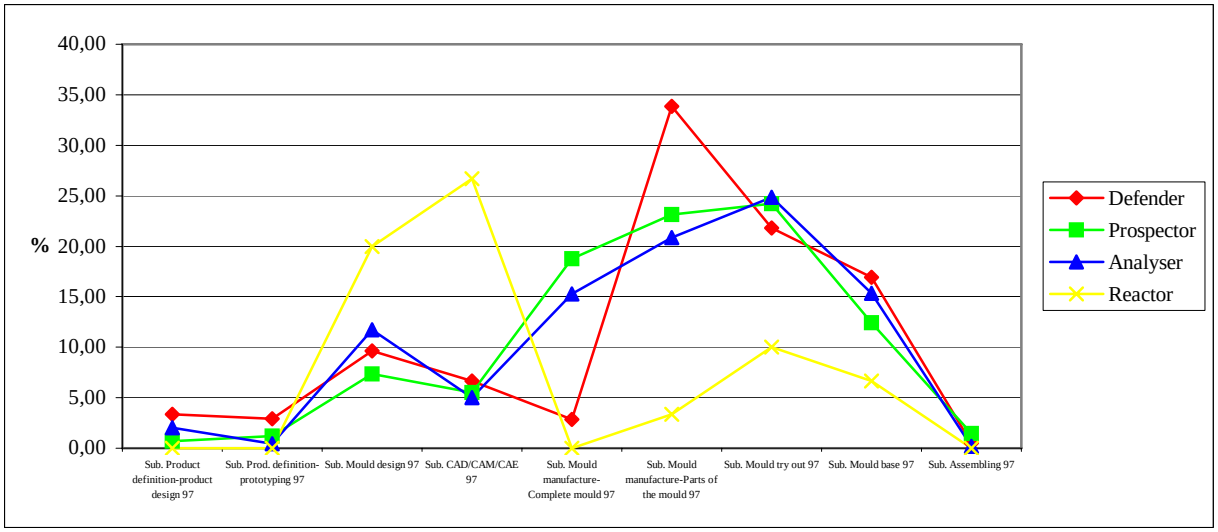


Figure 56E - The mould manufactured tasks subcontracted, 1997



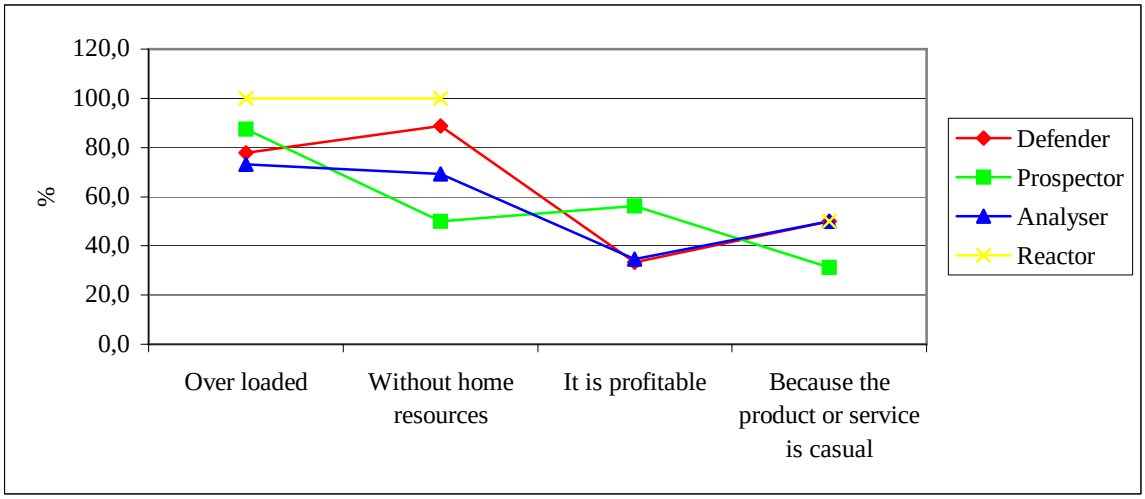
In aggregate the findings (see Figure 57) indicate that firms subcontract primarily because they are overloaded (79%), because they do not have home resources (71%), the service or product is casual (45%), and in last place because it is profitable (39%) Defenders subcontract because they do not have home resources. Defenders, as small firms, do not own all the necessary technology for the manufacturing process and therefore subcontract to other firms that specialise in certain services (e.g. milling, Electro erosion-EDM, mould bases, prototyping), or to micro firms. In these micro firms the tasks subcontracted could include polishing, texturing or even producing small parts of the mould. Prospectors subcontract because they are overloaded and because it

is profitable. For Prospectors, it is sometimes cheaper to subcontract the complete mould than to manufacture it themselves. As large firms, Prospectors also have high costs and small firms can produce certain moulds more cheaply than them. There were no significant differences between strategy types and subcontracting as a result of being overloaded or because the product or service be casual.

Figure 57 - Cross-tabulation, strategy types and why firms subcontract, 1996

Cross tabs

Strategy Types 96	Over loaded	Without home resources	It is profitable	Because the service or product is casual
Defender	77,8%	88,9%	33,3	50,0%
Prospector	87,5%	50,0%	56,3	31,3%
Analyser	73,1%	69,2%	34,6	50,0%
Reactor	100,0%	100,0%		50,0%
Total	79,0%	71,0%	38,7	45,2%



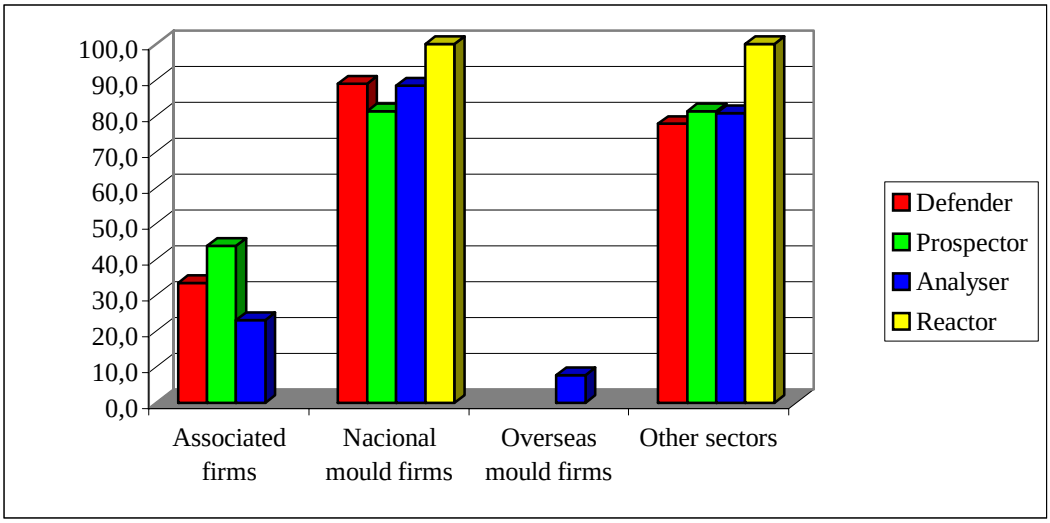
The results also reveal that there were no significant differences between strategy types and firms that subcontract. Firms subcontract overwhelmingly to other national mould makers and other sectors (see Figure 58). Nonetheless, it is interesting to see that Prospectors subcontract most to associated firms. Prospector firms are part of an industrial cluster (economic group) or supply chain that includes, for example, mould firms, engineering, milling, electro-erosion and plastic firms. So if they need to subcontract these services they prefer to do so within the cluster (economic group) or supply chain. It is interesting to see that Defenders also subcontract to associate firms. In discussion with top managers, it was mentioned that while Prospectors own other

firms as a result of their economic power (in general they are family run business or just one or two partners), Defenders often go on partnerships (with several partners) to establish other firms (e.g. trading, plastic injection, steel firms). Defenders saw this as a way of increasing competitiveness and gaining more power and a stronger position in the market place. For Defenders, access to certain resources is only possible with several partnerships or using other organisations.

Figure 58 - Cross-tabulation, strategy types and to whom firms subcontract

Cross tabs

Strategy Types 96	Associated firms	National mould firms	Overseas mould firms	Other sectors
Defender	33,3%	88,9%		78%
Prospector	43,8%	81,3%		81%
Analyser	23,1%	88,5%	7,7%	81%
Reactor		100,0%		100,0%
Total	30,6%	87,1%	3,2%	80,6%

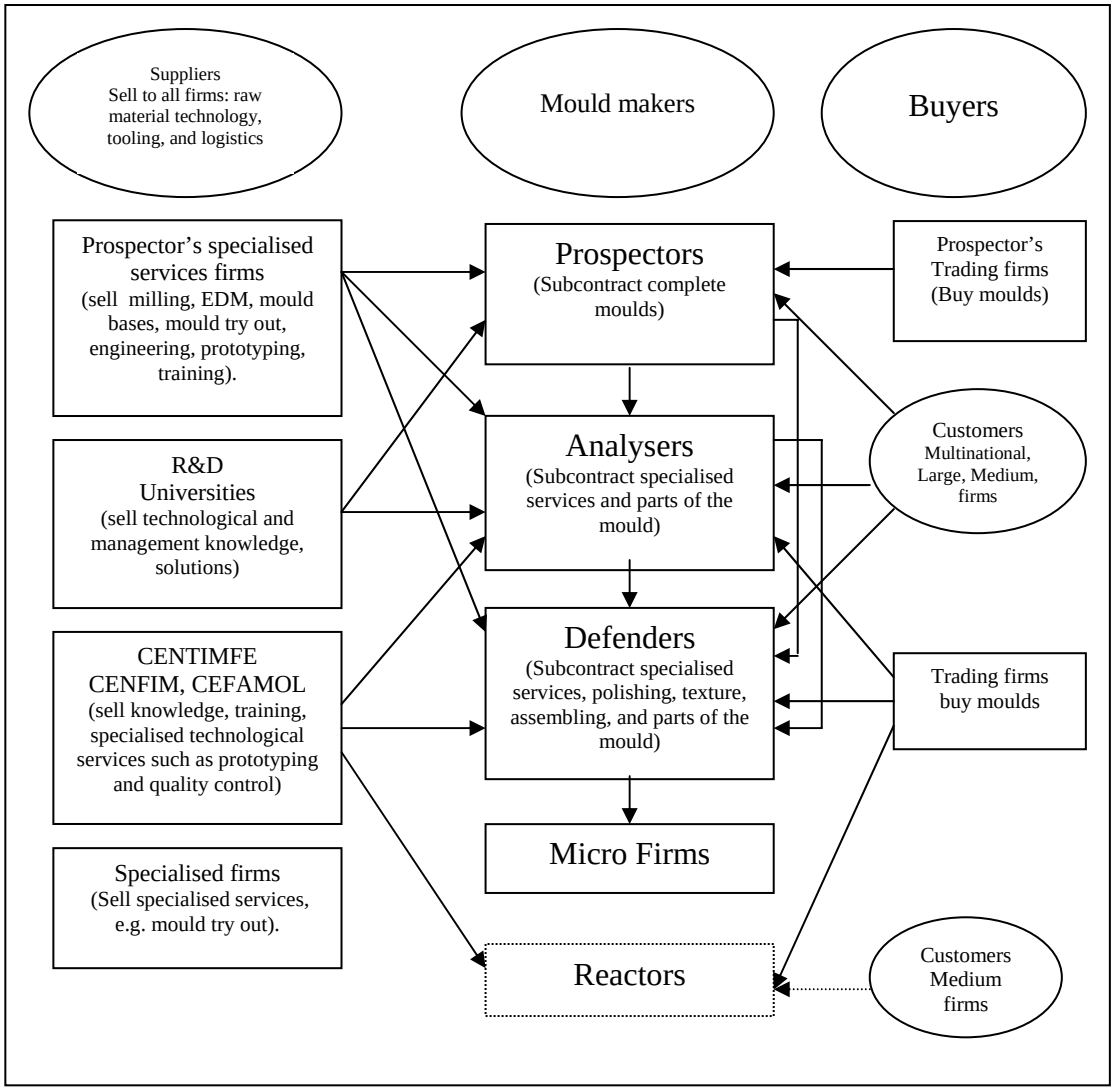


These findings have particular relevance for government policy markers because they show the intertwined network of business relationships within the Portuguese mould industry. The findings revealed that there is a clear hierarchy of strategy types regarding the subcontracting policy. This hierarchy and sectoral specialisation explains the nature of business interrelationships existing between firms and sustain the development of the industry with firms depending on one another. Prospectors, the top of the strategic type hierarchy, subcontract complete moulds to Analysers or Defenders either because they are overloaded or because it is profitable. Analysers subcontract specific services (e.g. mould bases, engineering services, training, milling, EDM, quality control) to

Prospectors (specialised firms) and complete moulds or parts of mould to Defenders. Analysers subcontract to Prospectors because they do not have the technology, and to Defenders because either they are overloaded or because Defenders are more efficient - this is, indeed, one of the defining characteristics of a Defender. Hence Defenders have a niche in the industry as they can do specific tasks cheaper than other types of firm. Defenders subcontract parts of the mould or specific tasks in the mould production (e.g. polishing, texturing) to micro firms, to Prospector (specialised firms) and to specialise service firms in the sector. Analysers and Defenders also subcontract to sectoral institutions such as CENTIMFE and CENFIM for technological and training services.

The findings show that there is a high interdependency between firms and all rely upon one another (Figure 59). Different firms have built up a network of different capabilities that sustain the development of the industry. In order to overcome the shortage of resources and to increase competitiveness, firms have structured their organisations to serve not only their needs but also those of other firms. Firms build up effective technological and knowledge networks with a view to competitiveness. It is important to emphasise that CEFAMOL- the Portuguese association for the mould industry - states that the sector has approximately 250 firms. However, in the researcher's on-site data collection, many more firms than that were noted. It was observed that there were about 150 more, mostly small and micro firms, raising the total number of firms in the sector to 400. There are, therefore, a considerable number of small and micro firms whose main business is to produce moulds or parts of the moulds or to perform highly specific tasks in the mould production process: they exist solely as subcontractors to other mould making firms and are often Defenders. These micro firms are in the market place as subcontractors and by supplying services, they sustain the industry's production. The subcontracting relationship may be sporadic or it may be based on close long-term relationships particularly when specialised services are subcontracted.

Figure 59 - Building effective technological, knowledge and business networks relationships within the Portuguese mould industry



While many writers have examined many dimensions of the Miles and Snow model, few have examined in any detail the nature of the linkages between forms of different types within a given industry. By examining the detailed nature of subcontracting, this research reveals that the strategic types are not independent of each other and that their roles often complement each other. For example, while Prospectors may be looking to develop new products and to acquire new technology to do new tasks, their profitability and competitiveness may depend on a group of smaller Defenders who can undertake specific tasks in the mould production process a low cost. Given the desire to inform industrial policy through this thesis it is important to develop an understanding of the nature of these relationships as policies geared to the penetration of new markets might

initially depend on support being provided to Prospectors but unless complementary support is provided to Defenders, Prospectors may not be able to achieve sustainable profitability. Thus, the analysis of subcontracting between strategy types has provided useful information about the organisation of the industrial moulding sector, which has been used to provide a framework to support policy development (see Figure 59).

Are there differences in the organisational environment of different strategy types?

Top managers were asked to identify a set of environmental items as an opportunity, a threat or not applicable. In aggregate the results show that firms identified international economic crises (77.8%), Eastern European countries (61.9%), intermediary-trade firms (60.3%) and bureaucracy (57.1%) as threats. They identified the image of the Portuguese mould makers (96.8%), new markets (84.1%), and associateship (69.8%) as opportunities and they identified the maturity of some markets (57.1%), legislation (74.6%), political uncertainties (73%) and government support (66.7%) as not applicable (see Figure 60 and for further details see appendix 5M). Prospectors most identified Eastern European countries as a threat (75%). As Prospectors continuously seek customer and market opportunities, they are most aware of the competitive potential of Eastern European countries, especially the Czech Republic, as a threat. The findings conform to the theory. Defenders mainly identified intermediary-trade firms as a threat (66.7%). As seen previously, they depended on intermediary firms to sell abroad, which means that they continue to do deal with intermediaries not because they benefit but because they do not have an alternative. A Defender manager stated:

> "Intermediaries squeeze our profit margins, they push the mould price to the limit, leaving us with very narrow profit margins, while from their customers they ask for high prices, making significant profits. We are left with the hard work, the manufacture of the mould, they are left with a few bureaucratic tasks, some trips to the customers' plants and a huge gain".

This reveals that there are aspects of industrial organisation that may be prejudicial to the future of the sector as trade firms squeeze the profits of producers - especially Defenders - thus reducing their capacity to reinvest. In discussions with managers, it emerged that there is currently a general feeling of distress that may jeopardise the sustainable intertwined business network in this industry. Defenders may make efforts

to be less and less dependent on intermediaries, while the latter may be forced to buy from firms that do not have the knowledge or technological expertise to produce the moulds required. This, in turn, will jeopardise the international image of Portuguese mould makers.

Analysers overwhelmingly (92%) identified international economic crises as a threat. It is also interesting to note that Defenders and Prospectors in this category scored much the same, 66.7% and 62.5%. A possible explanation for this is that Defenders tend to maintain a relatively small but loyal group of customers, whereas Prospectors, who are continuously searching for new customers, may be less affected by an international economic crisis. It is noteworthy that while Analysers and Defenders identified Associateship (developing formal business relationships) as an opportunity (76.9% and 66.7% respectively), 43.8% of Prospectors identified it as not applicable. These findings are important for the development of sectoral policies by government and sectoral organisations. It shows that Analysers and Defenders rely on sectoral organisations and government support to overcome their difficulties, whereas Prospectors are less dependent on Associateship to pursue their business strategy. Although Defenders need support to be competitive, they say that the government has not done anything to help them: Defenders were most likely to report that government support does not exist - 77.8% of Defenders marked it as not applicable, in comparison to Analysers (69.2%) and Prospectors (43.8%). Defenders, as small firms, need and expect the government to create incentives to help them to increase competitiveness, otherwise their long-term existence may be compromised; they may not overcome the financial difficulties and indebtedness caused by the acquisition of technology. In an interview, one Defender manager stated:

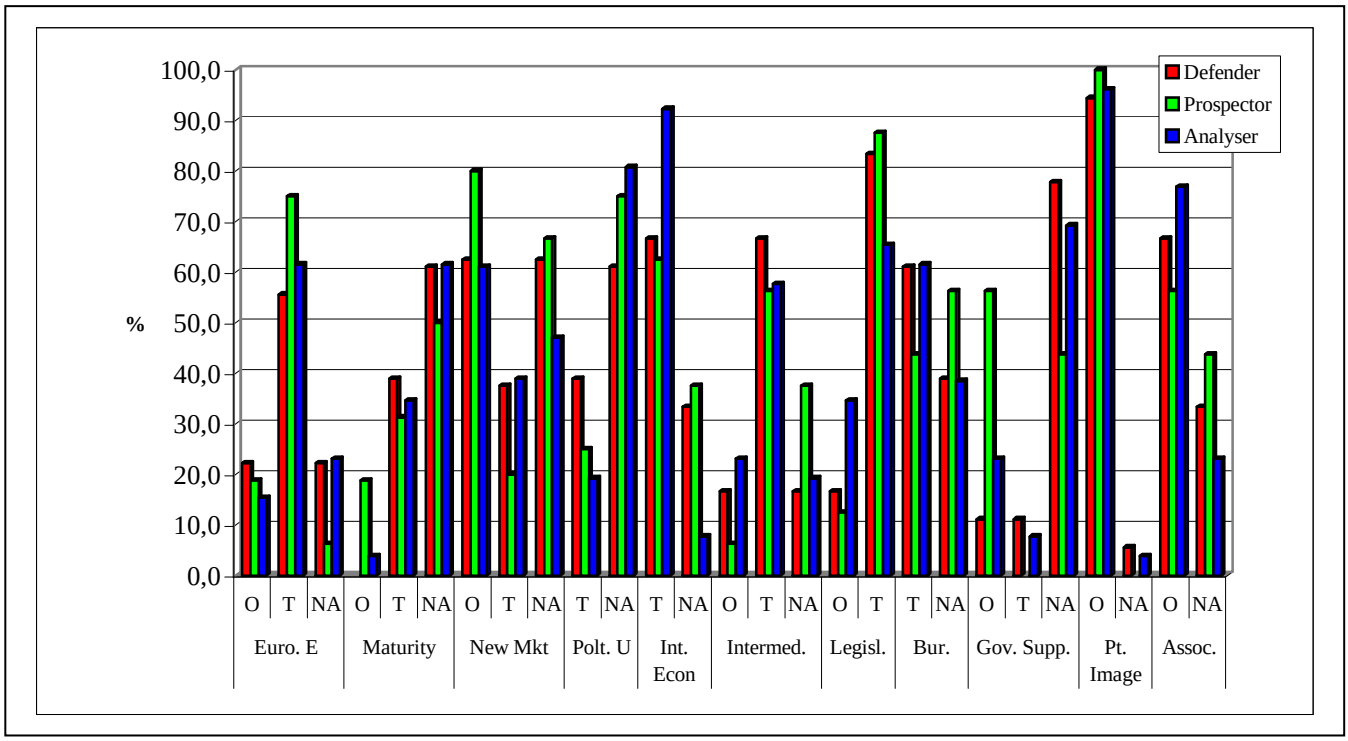
> “ICEP (equivalent to the British DTI) only supports the biggest firms. They are the ones to be invited to represent the industry overseas, to go on missions, to be at international trade fairs. The process is quite selective. The biggest firms manage sectoral organisations such as CENFINFE and CENFIM. They control the information, and use it to their best advantage. They work as a lobby in an exchange of favours. However, we, the small firms, the ones that really need help and support to sell abroad, are excluded from this process”.

However, when the ICEP's mould director was confronted with the above accusations, he explained:

> "if we are going to show the world what we do and what we are, we need to show them our best, and that in fact corresponds to medium and large firms and not small or micro firms".

The findings reveal that in terms of government policy making, something needs to be done to help Defenders to become more effective and efficient. Reactors did not show a consistent pattern.

Figure 60 - Cross-tabulation, strategy type and firms' environmental opportunities and threats, 1996



Note: O - Opportunities, T – Threats, NA- Not Applicable

The Miles and Snow strategic typology is applicable to the Portuguese mould industry. Different strategy types revealed different business profiles, which were on the whole consistent with the typology, *H1.2. was verified.*

Another aim of the current research was to explore the relationships between Miles and Snow's strategy types and organisational performance. The next section describes and analyses this issue.

6.2. Exploring the relationships between Miles and Snow's strategy types and organisational performance from a static viewpoint

According to Miles and Snow (1978), any of the three archetypes - Defenders, Prospectors, and Analysers - are equally likely to perform well, given that they respond to the challenges of the adaptive cycle in a consistent way and to outperform the Reactor strategy type. Smith et al. (1989) and Conant et al. (1990) corroborated the theory and their results showed that Defenders, Prospectors and Analysers performed equally well and consistently outperformed Reactors. Both researchers made use of a subjective self-report instrument to measure organisational performance: Smith et al. (1989) used sales growth, return on assets (ROA), and "overall performance" while Conant et al. (1990) used return on investment (ROI) and "overall performance". However, Snow and Hrebiniak's (1980) findings contradicted the theory. Snow and Hrebiniak (1980) investigated whether Defenders, Prospectors, and Analysers were better performers than Reactors in terms of profitability using return on assets (ROA). They found that Defenders, Prospectors and Analysers consistently outperformed Reactors in competitive industries but not in highly regulated industries, e.g. air transportation, where Reactors outperformed the three other strategy types. Reactors that are generally not a viable strategy in competitive industries performed successfully in "protected" environments. Reactors were generally associated with poor performance, while the other three strategy types were associated with varying degrees of positive performance. Reactors in the plastics, semiconductor and car industries consistently performed well below the mean financial performance of the four strategy types.

Hambrick (1983), Namiki (1989) and Zajac and Shortell (1989) argued that the three strategy types do not perform equally well in a given environment. They argued that certain environments favour certain strategic behaviours over others. Hambrick (1983) suggested that performance differences depend on the choice of the performance measures employed and on the nature of the business environment. Hambrick (1983) found that significant performance differences existed between Prospectors and Defenders and depended both on the environment and the performance measures used. He showed that Defenders outperformed Prospectors on profitability (return on

investment (ROI) and cash flow (CFOI) in non-innovative industries and that Prospectors outperformed Defenders in market share in innovative industries.

Namiki (1989) explored whether Defenders, Prospectors and Analysers outperformed Reactors in terms of Sales Growth, Return on Assets (ROA) and "overall performance" and showed that Prospectors, Defenders and Analysers had significantly higher Sales Growth than Reactors: however, no differences were found on Return on Assets (ROA) among the four strategy types. Namiki (1989) revealed that the three strategy types do not perform equally well in different environments as predicted by Miles and Snow (1978). Prospectors outperformed all the other types in terms of sales growth and "overall performance".

Zajac and Shortell (1989) demonstrated that strategies were not equally viable across different environmental settings and that they did not perform equally well. They investigated whether Defenders were less profitable than Prospector and Analyser strategies in a new health care environment and concluded that there were significant performance differences between groups pursuing different generic strategies. Defenders were less profitable than Prospectors and Analysers after environmental changes in terms of the profit margin ratio. Prospector and Analyser hospitals outperformed Defenders in a proactive environment. Their findings suggest that organisations embedded in dynamic environments and employing the Defender strategy type, were likely on average, to be less profitable than those pursuing other strategies. Shortell, Morrison and Friedman (1990) found that in a changeable environment, Prospectors and Analysers outperformed Defenders. Therefore, strategy types may not be equally viable in different environments and may not perform equally well. Zajac and Shortell (1989: 427) stated that "with respect to profitability differences, the results suggest that generic strategies are not equally viable. Defenders performed poorly relatively to Analysers and Prospectors. In other words, the hospitals' perception that the Defender strategy is not as viable in the new health care environment seems to be borne out in terms of actual financial performance". So, Snow and Hrebiniak's (1980), Hambrick (1983), Namiki (1989), Zajac and Shortell (1989), Shortell, Morrison and Friedman's (1990) verified the notion that certain environments favour certain strategies over others.

Miles and Snow (1978), Snow and Hrebiniak (1980) and Hambrick (1983) all suggest that Defenders see performance primarily in terms of efficiency (i.e. doing things right) while Prospectors perceive performance in terms of effectiveness (i.e. doing the right thing in terms of product/market development). Slater and Narver (1993) also showed that Defenders were committed to pursuing low costs. The organisational performance literature reveals that return on assets (ROA) is a good performance measure to assess efficiency and sales growth rate (SGR) is a good performance measure to assess the acceptance in the market place of new products or services. As a result, these measures were used to assess performance in Defender and Prospector businesses. It would be expected that Defenders have lower costs than Prospectors as they are committed to pursuing low costs. Given this literature, the following hypotheses were tested:

H2. Defenders, Prospectors, and Analysers will perform equally well and will outperform Reactors.

H2.1. Prospectors and Analysers strategies outperform Defenders in changeable environments.

H2.2. Defenders have a higher Return on Assets than Analysers, Prospectors and Reactors for the timescale analysed.

H2.3. Prospectors have a higher Sales Growth Rate than Analysers, Defenders and Reactors for the timescale analysed.

H2.4. Defenders are likely to have a lower product cost structure than Prospectors. Analysers will fall in between these two extremes.

In order to investigate the above hypotheses, the respondents were asked to give details about their balance sheet and profit and loss account, such as fixed assets, cash, debtors, other current assets, stocks, suppliers, short term liabilities, long term liabilities, equity capital, net profit after tax, net sales revenue, and the number of moulds produced for 1980-86, 1987-92, 1993-95 and 1996. With the information gathered a set of ratios was calculated. The indicators were:

- profitability (profit margin, return on equity (ROE) and return on assets (ROA))
- return on sales (ROS)

- sales growth (SGR)
- sales/number of moulds
- asset intensity
- sales per employee
- profit per employee (the employee ratios were only calculated for 1996 as the number of employees item was only asked for 1996).

A range of performance measures was used in order to ensure the validity of the research findings. Additionally, mould makers were asked to specify their product costs structure in terms of percentage of the total costs for 1996. To emphasise the differences between strategy types, the mean for each item was calculated and then subtracted from the total mean and divided by the standard deviation. Of the 63 firms surveyed, three did not provide the financial data and three only gave it for 1996.

The findings reveal that, as suggested by the theory, Defenders, Prospectors, and Analysers outperformed Reactors. Support was found for Miles and Snow (1978), Smith et al. (1989) and Conant et al.'s (1990) results. However, contrary to expectations, the three strategy types did not perform equally well. The results show that when the environment was relatively sable, Defenders outperformed the other strategic types (e.g. on profit margin, return on assets, return on sales and sales growth rate) and in more changeable and dynamic settings, Prospectors outperformed the others (see Figure 61). Defenders in stable environments (1980-86, and 1987-92; however in the latter period differences were less significant) outperformed Prospectors and Analysers (see Figure 61A and B). After significant environmental changes (after 1987-92), Defenders started to perform poorly, in particular in 1996 (see Figure 61C and D). In contrast, in 1993-95 Prospectors unquestionably outperformed the other strategic groups (particularly on return on equity, return on assets and on sales/moulds) and in 1996 they reinforced their performance leadership, especially on the employee ratios (sales per employee and profit per employee) and on sales/moulds suggesting higher levels of productivity than other strategy types (Figure 61C and D). It is also important to note that Prospectors showed the highest sales/moulds ratio, indicating that as competition grows worldwide firms specialise their production and therefore produce fewer but more added value moulds. So, in sum, Defenders performed well in stable environments, but under-performed in dynamic settings and vice versa for Prospectors.

Support was found for the notion that different environmental contexts favour different strategy types; strategy types do not perform equally well in different environments. The findings corroborate Snow and Hrebiniak (1980), Hambrick (1983), Namiki (1989), Zajac and Shortell (1989) and Shortell, Morrison and Friedman's (1990) results. As expected by the theory, Analysers scored in between Defenders and Prospectors.

The findings also indicate that, contrary to expectations (it would be expected that Defenders have higher return on assets and Prospectors higher sales growth rates), Defenders had a higher ROA but only in stable environments (i.e. in the 1980-86 period) after which (in 1987-92 and 1993-95) Defenders and Analysers accounted for the same value, and in 1996 they performed poorly. Furthermore, Defenders rather than Prospectors outperformed the other strategy types in terms of sales growth in stable environments; Defenders had a higher sales growth rate until 1987-92. However, from 1980-86 to 1987-92 the ratio decreased and in 1993-95 Defenders and Analysers accounted for the same value (for further details about the organisational performance see also appendix 5N). A possible explanation for why Prospectors did not show a higher growth rate than Defenders is that Prospectors have been established since the beginning of the sector's development, and they have grown continuously with the sector. As they are large firms, an increase in their sales does not significantly alter their sales growth rate. On the other hand, Defenders were established when the sector was booming (in the beginning of the 80s) and, as small firms, a significant increase in their sales has important repercussions on their sales growth rate. It is also suggested that while the sales growth rate is a good indicator to measure the success of the new product or service in the market place, it may not be a good measure for this particular industry, as the mould product is customised, its manufacture is strictly dependent on a customer order. Therefore the inconsistencies found may be a consequence of the particular characteristics of this industry.

Additionally, Defenders performed better as small firms and Prospectors as large firms. Smith, Guthrie and Chen (1989) demonstrated that a firm's size could explain differences in the relationship between strategy and performance. They showed that Defenders, Analysers and Prospectors performed equally well and consistently outperform Reactors, corroborating Miles and Snow (1978). However, contrary to the

theoretical expectations, Defenders performed better as small firms, and Prospectors as large firms. Support was found for Smiths et al's. (1989) results. The size of strategy types in the typology was questioned. It is suggested that the identification of the specific inconsistencies is a result of the particular characteristics of the Portuguese mould industry and its development.

The findings also indicated that Defenders (see Figure 62) have on average the lowest cost structure (with the exception on workforce, accessories and components). Prospectors have the lowest costs on workforce but the highest on subcontracts and "others costs" (which includes transport, taxes, etc). In discussion with a Defender firm it was mentioned that their competitive advantage is based on their employee's long-term experience and know-how, so in order to retain their most knowledgeable employees they have to pay them very well, which explains the high value on workforce costs. Conversely, Prospectors had the lowest costs on workforce; the technology, particularly at the workshop level, does the job for them. Prospectors have also high subcontracting costs. As mentioned before, as Prospectors produce large to very large moulds it is understandable that they subcontract parts of the moulds or complete moulds of medium to small dimension capacity. It will work out cheaper for them to subcontract than to produce.

As suggested by the theory, Defenders emphasise performance in terms of manufacturing efficiency, while Prospectors evaluate performance in terms of market effectiveness. Hambrick (1983), Snow and Hrebiniak (1980) and Slater and Narver (1993) showed that Defenders based their competitive advantage on low cost and the findings here lend support to the idea that Defenders are more efficient than Prospectors, which is consistent the literature review.

Figure 61 - Means, strategy types and the organisational performance ratios, 1980-96

Figure 61A - Strategy types and the organisational performance ratios, 1980-86.

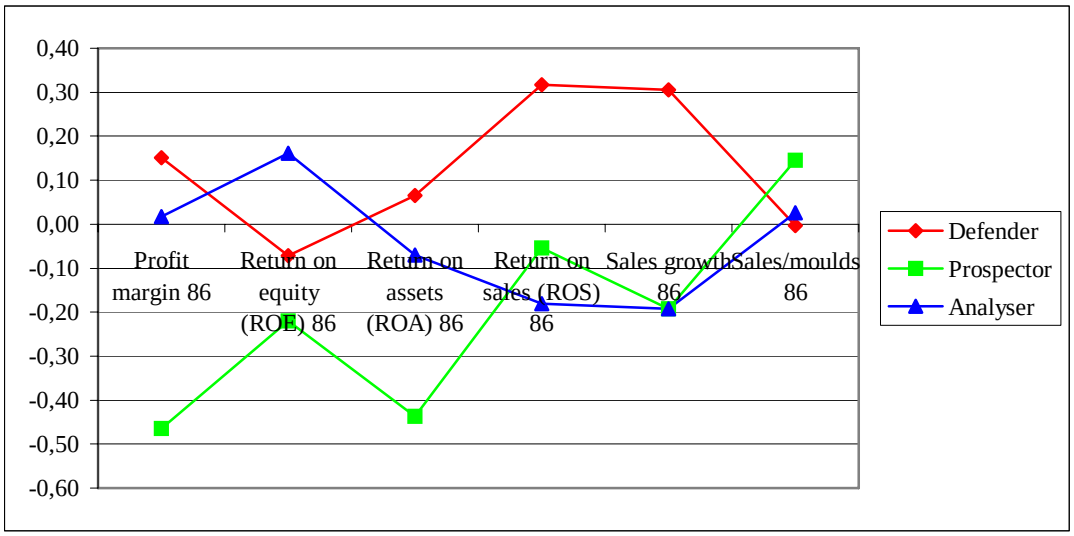


Figure 61B - Strategy types and the organisational performance ratios, 1987-92

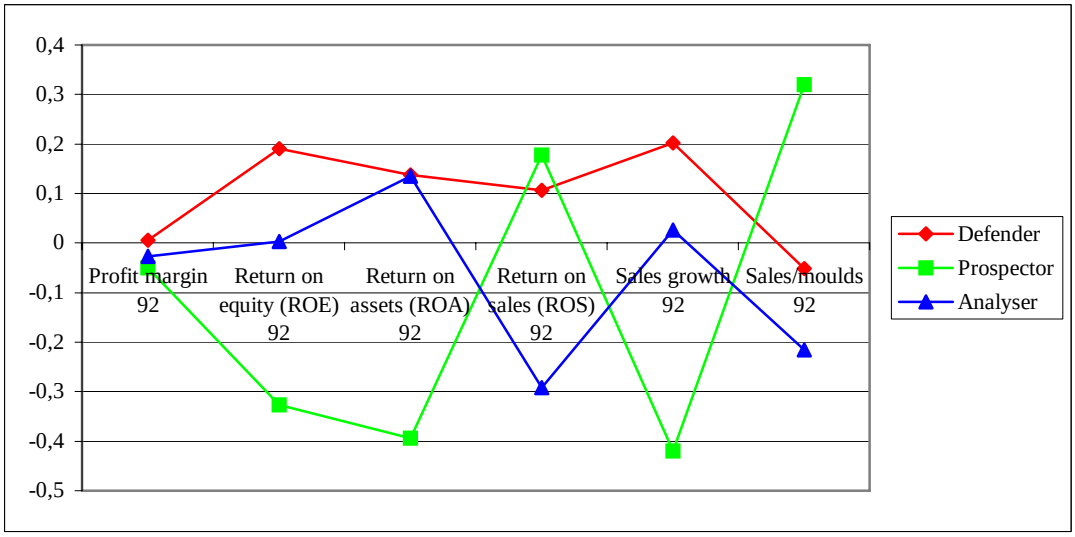


Figure 61C - Strategy types and the organisational performance ratios, 1993-95

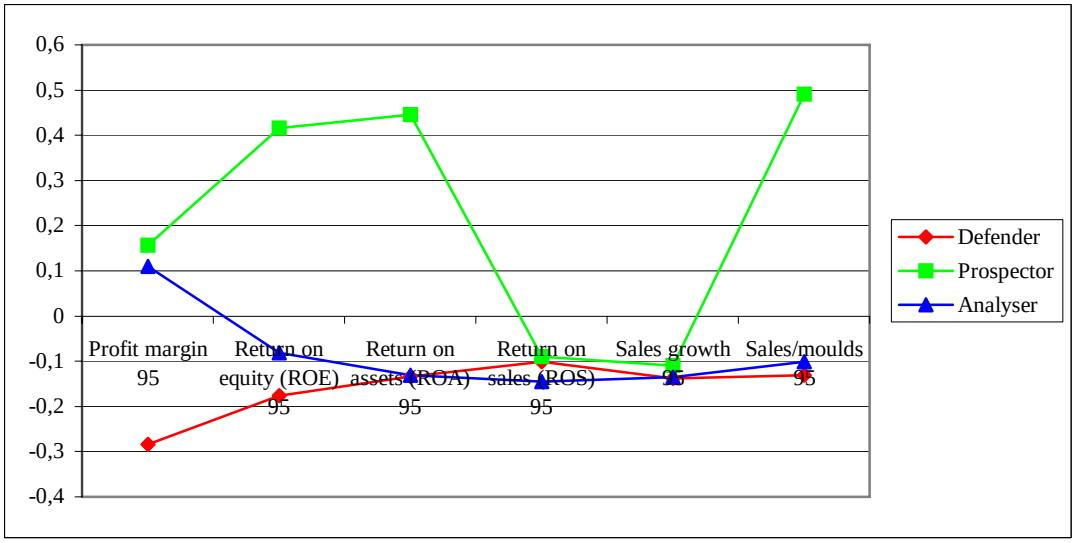
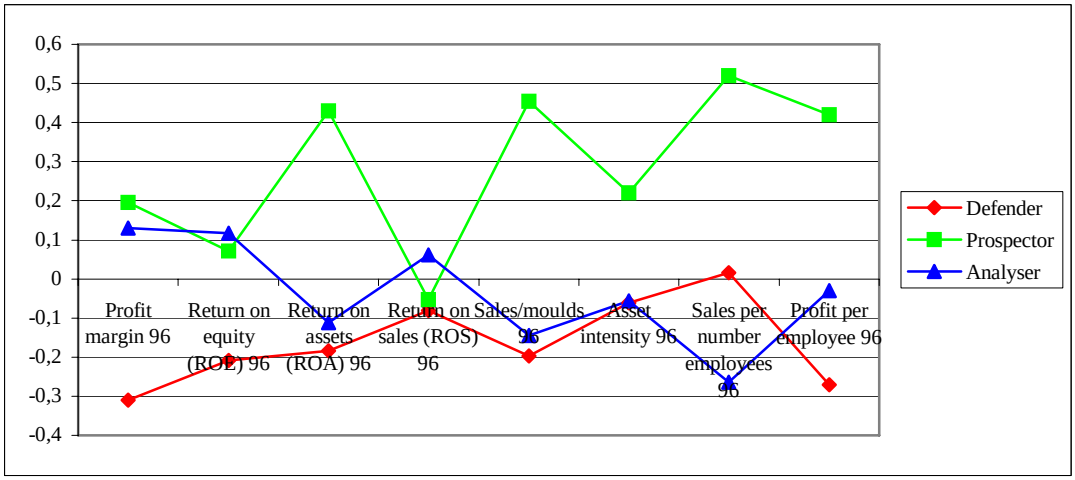


Figure 61 Cont. - Means, strategy types and the organisational performance ratios, 1980-96.

Figure 61D - Strategy types and the organisational performance ratios, 1996

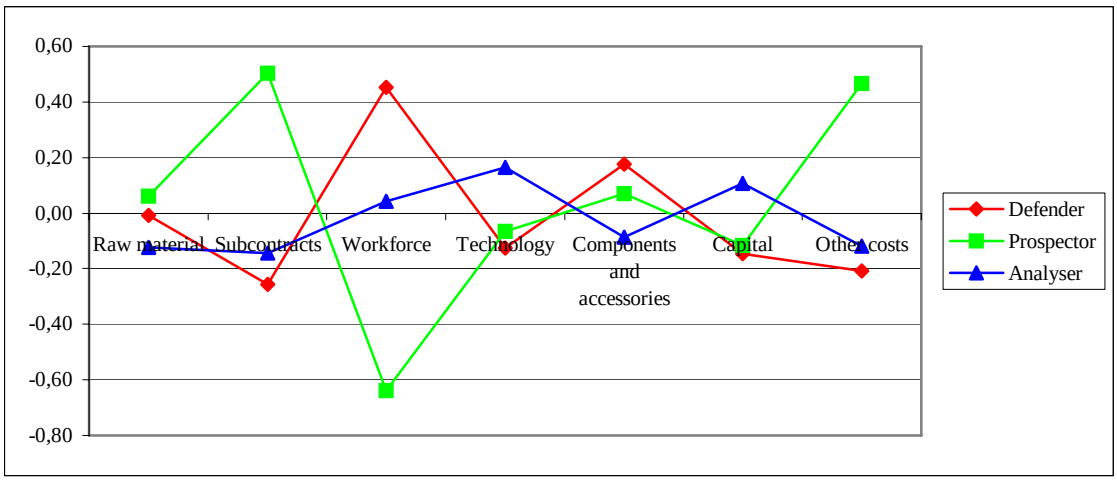


Note: To emphasise the strategic differences between strategy types, the mean was calculated for each item, and then subtracted from the total mean and divided by the standard deviation.

Figure 62 - Means, strategy types and the product cost structure, 1996

Strategy Types 96	Raw material	Subcontracts	Workforce	Technology	Components and accessories	Capital	Other costs
Defender	15,6	7,8	39,5	21,7	10,4	5,1	0,0
Prospector	15,9	12,6	29,8	22,3	9,9	5,2	4,3
Analyser	14,9	8,5	35,8	24,3	9,3	6,2	0,6
Reactor	20,0	10,0	38,3	20,0	6,7	8,3	0,0
Total	15,6	9,4	35,5	22,8	9,6	5,7	1,3
Std. Deviation	5,56	6,39	8,88	8,80	4,25	4,64	6,37

Strategy Types 96	Raw material	Subcontracts	Workforce	Technology	Components and accessories	Capital	Other costs
Defender	-0,01	-0,26	0,45	-0,13	0,18	-0,15	-0,21
Prospector	0,06	0,50	-0,64	-0,07	0,07	-0,12	0,47
Analyser	-0,12	-0,14	0,04	0,16	-0,09	0,11	-0,12
Reactor	0,79	0,09	0,32	-0,32	-0,70	0,56	-0,21
Total	0,00	0,00	0,00	0,00	0,00	0,00	0,00



Note: To emphasise the strategic differences between strategy types, the mean was calculated for each item, and then subtracted from the total mean and divided by the standard deviation.

In summary, the findings show that Defenders, Prospectors and Analysers outperformed Reactors and support was found for Miles and Snow (1978), Smith et al. (1989) and Conant et al. (1990). However, the notion that the three strategy types perform equally well in different environments was contradicted; the three types did not perform equally well in different environments. Defenders outperformed the other strategic types in relatively stable environments (1980-86 and 1987-92) and Prospectors outperformed the other strategy types in changeable environments (after 1987-92). The findings corroborate Hambrick (1983), Namiki (1989), Zajac and Shortell (1989) and Shortell, Morison and Friedman's (1990) view that strategies do not perform equally well and are not equally viable across different environmental settings. This contradicts Miles and Snow (1978), Smith et al. (1989) and Conant et al.'s (1990) findings thus the *H2 hypothesis was rejected, Defenders, Prospectors and Analysers outperformed Reactors but they did not perform equally well.*

Additionally, contrary to expectations derive from the literature, the findings indicate that Defenders outperformed Prospectors on ROA but only in stable environments (1980-86 and 1987-92) and Defenders rather than Prospectors outperformed the other strategy types in terms of sales growth, but also only in stable environments. Thus, the *hypothesis H2.1. was verified: Prospectors and Analysers strategies outperform Defenders in changeable environments,* and *the hypotheses H2.2. and H2.3 were rejected: Defenders had higher return on assets (ROA) and sales growth rate in stable environments, but and in dynamic environments it was the Prospectors.* The inconsistencies found may be a result of the particular characteristics of this industry's development.

Moreover, the findings, contrary to expectations, found that Defenders performed better as small firms and Prospectors as large firms. Support was found for Smith's et al. (1989). Again, the inconsistencies found in size and strategy types may be a result of the Portuguese mould industry's development.

The findings also indicated that Defenders had the lowest cost structure. The findings corroborate the view that Defenders tend to be more efficient than Prospectors. Support was found for Miles and Snow (1978), Snow and Hrebiniak (1980), Hambrick (1983) and Slater and Narver's (1993) findings. *Thus, the H2.4. hypothesis was confirmed: Defenders are likely to have a lower product cost structure than Prospectors. Analysers will fall in between these two extremes.*

This section explored the relationships between Miles and Snow's strategy types and organisational performance in a static perspective (cross-sectional study). Previous researchers have also tested Miles and Snow using cross-sectional studies; however, they have surprisingly neglected the analysis of the typology over time. Another aim of this research is to understand the dynamics of business strategy and this is the focus of the next section.

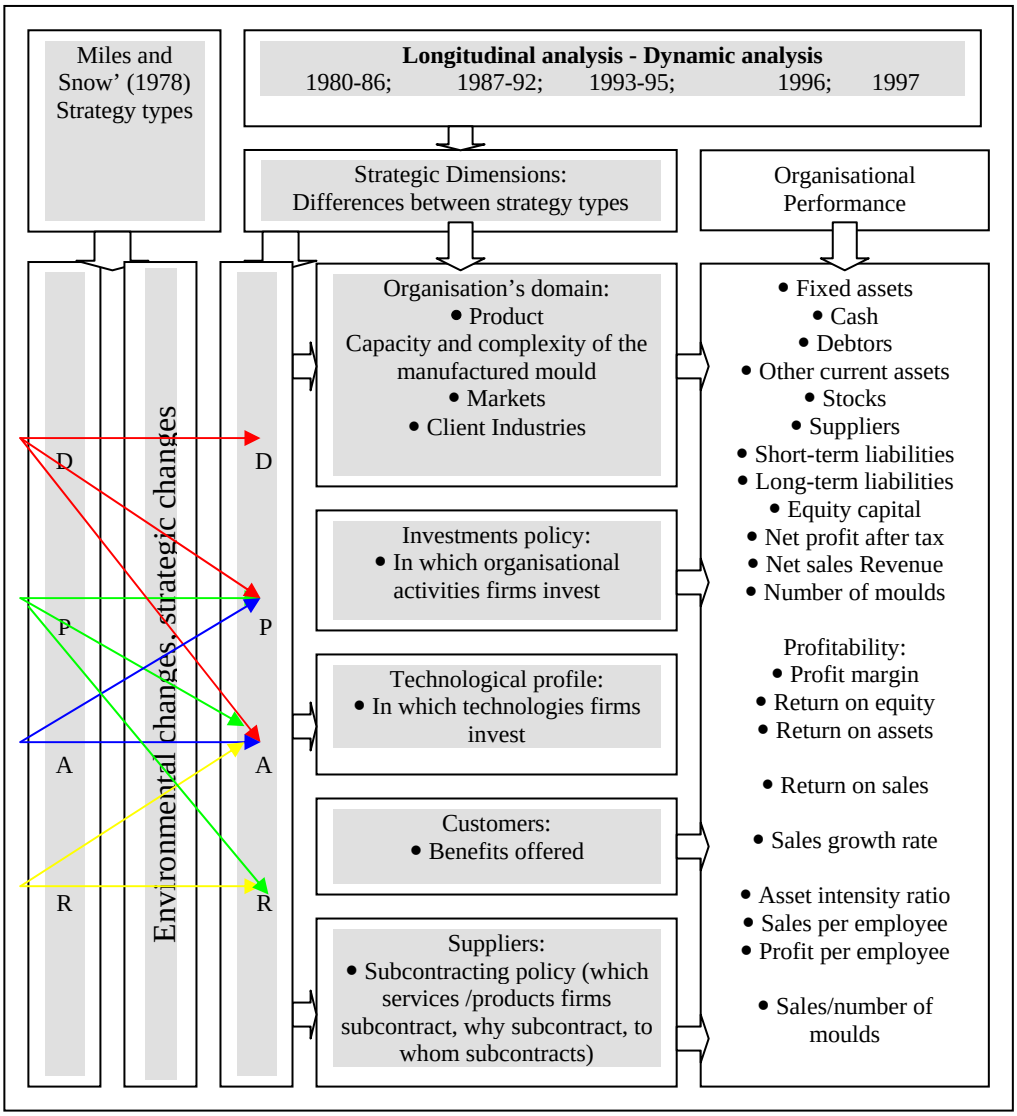
6.3. Exploring the dynamics of Miles and Snow's strategy types

This section of the analysis relates to the study of Miles and Snow's strategy types from a dynamic perspective using longitudinal analysis. The objectives of this section (see Figure 63) are to explore how business strategy has evolved over the years in response to environmental changes, how firms have adapted to the changing environment, whether they have changed their strategic behaviour over time (discontinuous changes) or have maintained it, making minor adjustments (incremental changes), whether there is a pattern in the change between strategic types (which specific strategy type firms moved to/from) and whether firms that changed their strategy *(the Movers)*, have different business profiles from those that maintained their position *(the Stayers)*.

According to Miles and Snow (1978), strategies tend to persist over time, in that they assert that Defender, Prospector and Analyser behaviours are equally viable in different environmental contexts. It is assumed that strategic change is rare and difficult and it is argued that organisations select their strategy, and over time, tend to develop their internal arrangements to be consistent with that strategic stance. Therefore, change is difficult, expensive and, consequently, unlikely to happen and, it is argued that, firms only change their strategy when it is absolutely necessary (Miller, 1986). Consequently,

it is expected that firms tend to maintain their strategies for long periods and, in this context we might expect that Prospectors tend to want to continue prospecting and Defenders tend to want to continue defending. This "stasis" point of view is shared by several writers including Oster (1982), Miles and Cameron (1982) and Miller and Friesen (1984).

Figure 63 - The conceptual framework: the dynamic perspective



Oster (1982) suggests that organisations might be reluctant or unable to change strategies, which have become entrenched. Miller and Friesen (1984) claim that firms not only continue with their existing strategy even confronting environmental changes but they tend to extend it. However, Hambrick (1983) argued that the success of strategy types varies across different industrial environments. Firms may not equally

succeed across different environmental contexts. Firms may change their strategy in order to adapt to the new environment as their previous strategy ceases to be viable in the new setting. Yet Hambrick's cross-sectional study does not explore strategic changes over time in response to environmental changes. Therefore, there was a need to explore if, and how, firms change their strategies as the environment changes over time.

With the exception of Zajac and Shortell (1989) and Smith and Grimm (1987), the dynamic process of changing from one strategy type to another as a result of environmental changes has been surprisingly neglected in the literature. Zajac and Shortell (1989) in their research explored strategy types, changes over time, the likely direction of change in response to the changing environmental conditions (i.e. the notion of equally viable strategy types versus particular appropriate strategy and environmental combinations), and the performance implications of these dynamics. They concluded that organisations do change their strategies in response to particular environmental shifts. As they stated, "changing strategies appears to be a major tool used by organisations in dealing with their changing environment" (1989:427). The impact of a specific major environmental change can produce changes in strategy in a non-random way, driving firms to move way from one strategy type to another. They add that major environmental changes do not simply result in changes in strategy but there is a patterned response to changing strategy across organisations. Their findings demonstrated that 55% of the hospitals studied did change their strategy as the environment changed: hospitals shifted away from being Defenders to primarily becoming Analysers and Prospectors. Shifting away from the Defender strategy suggests that organisations do not all perceive generic strategies to be equally viable in new environments, which contradicts one of Miles and Snow's core assumptions. They also showed that organisations that view themselves as Analysers were not likely to change their strategy even after dramatic environmental changes. As suggested by Miles and Snow (1978:78), "balance is the common characteristic of the Analyser's solutions to the three problems of organisational adaptation" and a true Analyser is an organisation that minimises risk while maximizing the opportunity for profits, that is, an experienced Analyser combines the strengths of both Prospector and Defender into a single system. According to Zajac and Shortell (1989), Defenders in a new changeable environment would be expected to change their strategy to Analysers or Prospectors.

Analysers, as a "balanced strategy", are the type to which firms will most change, as well as being the least likely to change to another strategy type. Reactors are unlikely to change to another strategy type. Smith and Grimm (1987), in their study of the railroad industry, verified that most railroad firms changed their strategies in response to railroad deregulation. Therefore, firms do not perceive strategy types to be equally viable in different environments across time; organisations do change their strategies. The objective here is to try to identify patterns in how firms in the Portuguese mould sector have changed their strategies in response to changed environmental conditions.

In order to find support for Zajac and Shortel's (1989) findings the following hypotheses were developed and explored in the Portuguese mould industry:

H3. Firms change Miles and Snow's strategy types over the period 1980-1997. Firms change their strategy in response to environmental shifts.

H3.1. Defenders are most likely to change their strategy in response to significant environmental changes.

H3.2. Defenders are likely to change their strategy to Analysers or Prospectors.

H3.3. As Analysers are seen as a balanced strategy, firms who change their strategic behaviour are likely to change their strategy to the Analyser strategy type.

H3.4. Analysers are unlikely to change to another strategy type.

H3.5. Reactors are unlikely to change their strategy.

H3.6. Firms that change their strategy, i.e. the Movers, have different business profiles from firms that maintain their strategy types, i.e. the Stayers.

Are there differences by strategy type in how firms respond to significant environmental changes?

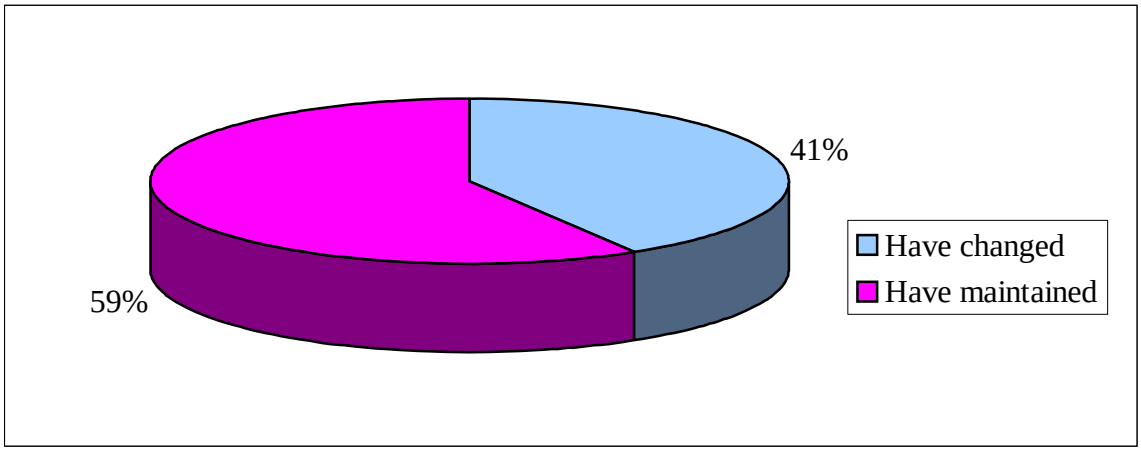
To investigate the above hypotheses, respondents were asked to identify, using the self-typing paragraph approach, which type best characterised their organisation for the five time periods (1980-86, 1987-92, 1993-95, 1996 and 1997). The findings reveal (see Figure 64) that the majority of the firms (59% or 37 out of 63) maintained their strategy type over time and that 41% (26 out of 63) changed their strategic stance. Fifty-nine percent of the Portuguese mould makers perceived that their strategies were equally

viable across different environmental contexts and by implication across time, thus providing some support for those writers who have argued for a "stasis" view of strategy, i.e. Oster (1982), Miller and Friesen (1984) and Miles and Snow (1978). However, 41% of firms did change their strategy showing that a significant percentage of firms change their strategies over time. Zajac and Shortell (1989) and Smith and Grimm's (1987) results were corroborated.

Figure 64 - Frequencies, firms that maintained and changed Miles and Snow's strategy types over the period, 1980-97

PERPCHAG

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have changed	26	41,3 %	41,3%	41,3%
	Have maintained	37	58,7%	58,7%	100,0%
	Total	63	100,0%	100,0%	



Among *Stayers* (firms that maintained their strategy over the period 1980-97), Defenders (43%, 16 out of 37) were the dominant strategy type (Figure 65). This shows that the majority of the Portuguese mould firms that maintained their strategy were defensive in their strategic orientation. Defenders were followed by Analysers (32%) and Prospectors (22%). Only 1 out of 37 firms chose to remain a Reactor over the period. This outcome is important because reveals that over 17 years, from 1980 to 1997, through stable and dynamic environments, Reactors were able to survive.

Among *Movers* (firms that changed their strategy over the period 1980-97), Defenders were the predominant strategy type until 1987-1982; after that period Analysers became the leading strategy type, and strengthened their leadership from then onwards (Figure 66). In 1993-1995, the number of firms that moved to Analysers doubled in comparison

with the previous period (from 6 firms in 1987-92 to 12 firms in 1993-95), while the number of Defenders were reduced to half (from 10 firms in 1987-92 to 5 firms in 1993-95). Prospectors remained stable over the timescale.

The findings showed that while the environment was relatively stable, the majority of the firms followed the Defender strategy type. However, after significant environmental changes over the period 1987-92, the number of Defenders continuously decreased and Analysers became the dominant group. The 1980-86 period was one of relative environmental stability. The international economy favoured economic development. The world demand for moulds was greater than the world market supply, and the Portuguese mould industry had an opportunity to grow. Most managers would therefore be expected to perceive their strategy type as Defenders. In the late 80s and early 90's, the environmental context of the Portuguese mould industry changed significantly. An international economic crisis, growing competition, technological developments, variation in exchange rates and the Portuguese admission to the EC had a major impact on firms' strategic orientation. Consequently, as major environmental shifts took place, managers would be expected to identify their strategy as Analysers or Prospectors. As Miles and Snow suggest (1978:47) "Defenders enact an environment of greater stability than do their counterparts within the same industry. Defenders deliberately create and maintain an environment for which a stable form of organisation is appropriate". "Prospectors enact an environment that is more dynamic than those of other types of organisations within the same industry"(1978:65). The findings confirm the theory. Defenders were suitable for the stable environments found in 1980-86 and 1987-92[2] and Prospectors had a better fit with the more dynamic and turbulent environments found in 1993-95, 1996 and 1997. The impact of a particular major environment can produce changes in strategy driven firms to move away from one strategy type towards another. Major environmental changes do not simply result in changes in strategy, but there is a pattern of strategy across organisations. *Therefore H3. hypothesis was confirmed: firms changed Miles and Snow's strategy types over the period 1980-1997, as a response to environmental shifts.*

[2] 1987-92 is the period in which most significant environmental changes occurred. If firms are change their strategy that happens not during the environmental shifts, but just immediately after (i.e. 1993-95). So the impact of strategic change will be only noted after 1987-92, i.e. in 1993-95.

Figure 65 - Frequencies of *Stayers* - those firms that maintained Miles and Snow's strategy types over the period 1980-97

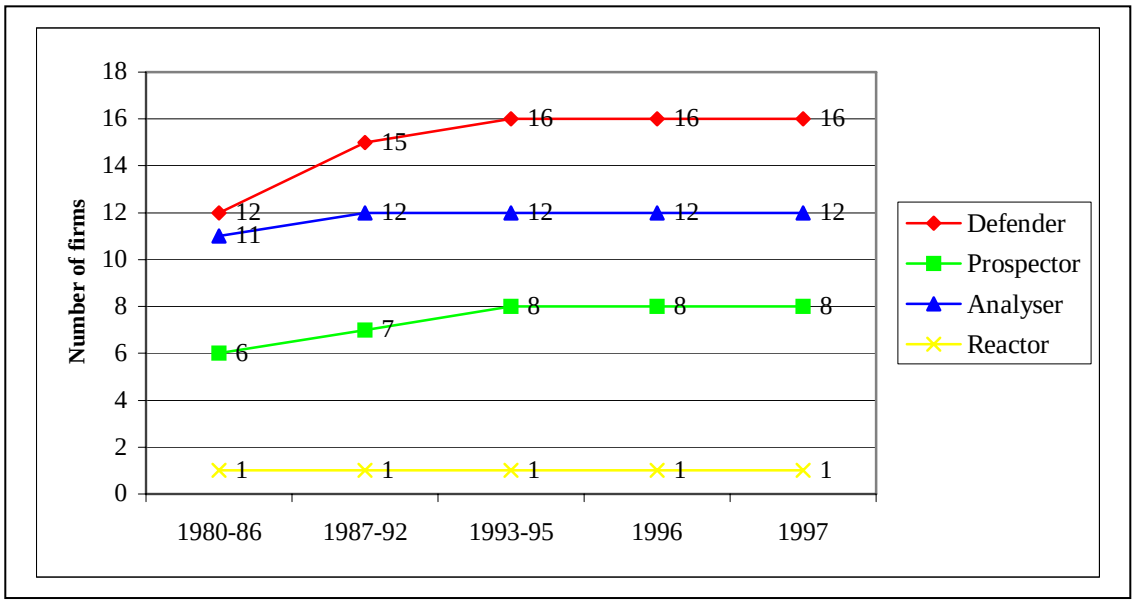
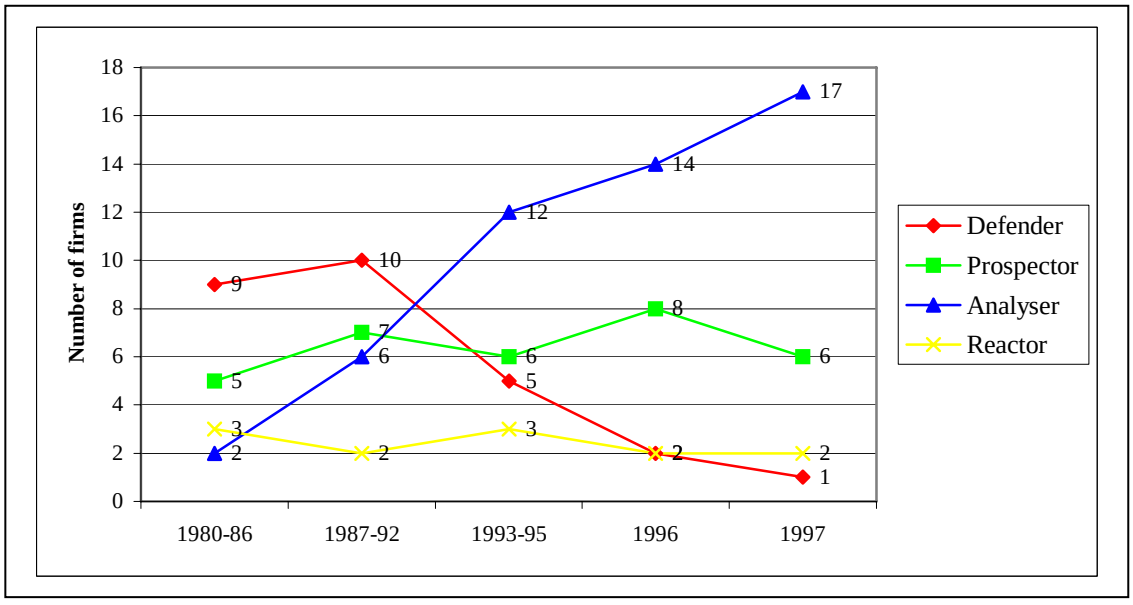


Figure 66 - Frequencies of *Movers* - those firms that changed Miles and Snow's strategy types over the period 1980-97



After having analysed how firms respond to environmental changes, the next objective is to ascertain whether there is a pattern of change between strategic types.

Are there differences in patterns of change between strategy types?

From which strategy type did firms move? The findings reveal (see Figure 67) that firms moved away primarily from being Defenders (42%, 11 out of 26). Consistent with Zajac and Shortell's (1989) results, Defenders were the strategy type from which firms most changed. Thus, *H3.1. hypothesis was confirmed: Defenders are most likely to change their strategy in response to significant environmental changes.* Contrary to the theoretical expectations, Reactors were the second most important group from which firms changed their strategy (23%, 6 out of 26). According to the literature, Reactors seldom make adjustments of any sort until they are forced to do so by environmental pressures. A possible explanation is that Reactors may seek consistency for their product-market orientation and in that search they may move to another strategy type. This outcome is extremely important because reveals that Reactors are able to change their strategic orientation towards another strategy type. Hence *H3.5. hypothesis was rejected: Reactors did change their strategy*. Consistent with Zajac and Shortell' (1989) findings, Analysers were least likely to change to another type (15%, 4 out of 26). Analysers are considered by Miles and Snow (1978) to be the balanced strategy. *Thus, the H3.4. hypothesis was confirmed: Analysers are unlikely to change to another type.*

To which strategy type did firms move? As expected (Figure 67), firms moved primarily to the Analyser type (65% of firms, 17 out of 26). Forty-two percent of Defenders (11 out of 26), 19% of Reactors (5 out of 26) and 15% of Prospectors (4 out of 26) changed their strategy type to Analysers. The Portuguese mould managers under dynamic environments prefer to follow a wise strategy, a strategy that enables them to defend a position and at the same time to move quickly to take advantage of product-market opportunities. The *H3.3. hypothesis was verified: as Analysers are seen as having a balanced strategy, firms who change their strategic behaviour are likely to change their strategy to the Analyser strategy type.*

From to which strategy type did firms move? Firms moved mainly from the Defender strategy type to Analysers (27% firms, 7 out of 26) and Prospectors (15%, 4 out of 26). The findings are consistent with Zajac and Shortell's (1989) results. It is interesting to note that there was only one Defender in 1997 that moved from Reactor. The finding emphasise that Defenders are unlikely to be suitable for changeable and dynamic environments. The *H3.2 hypotheses were confirmed: Defenders are likely to change*

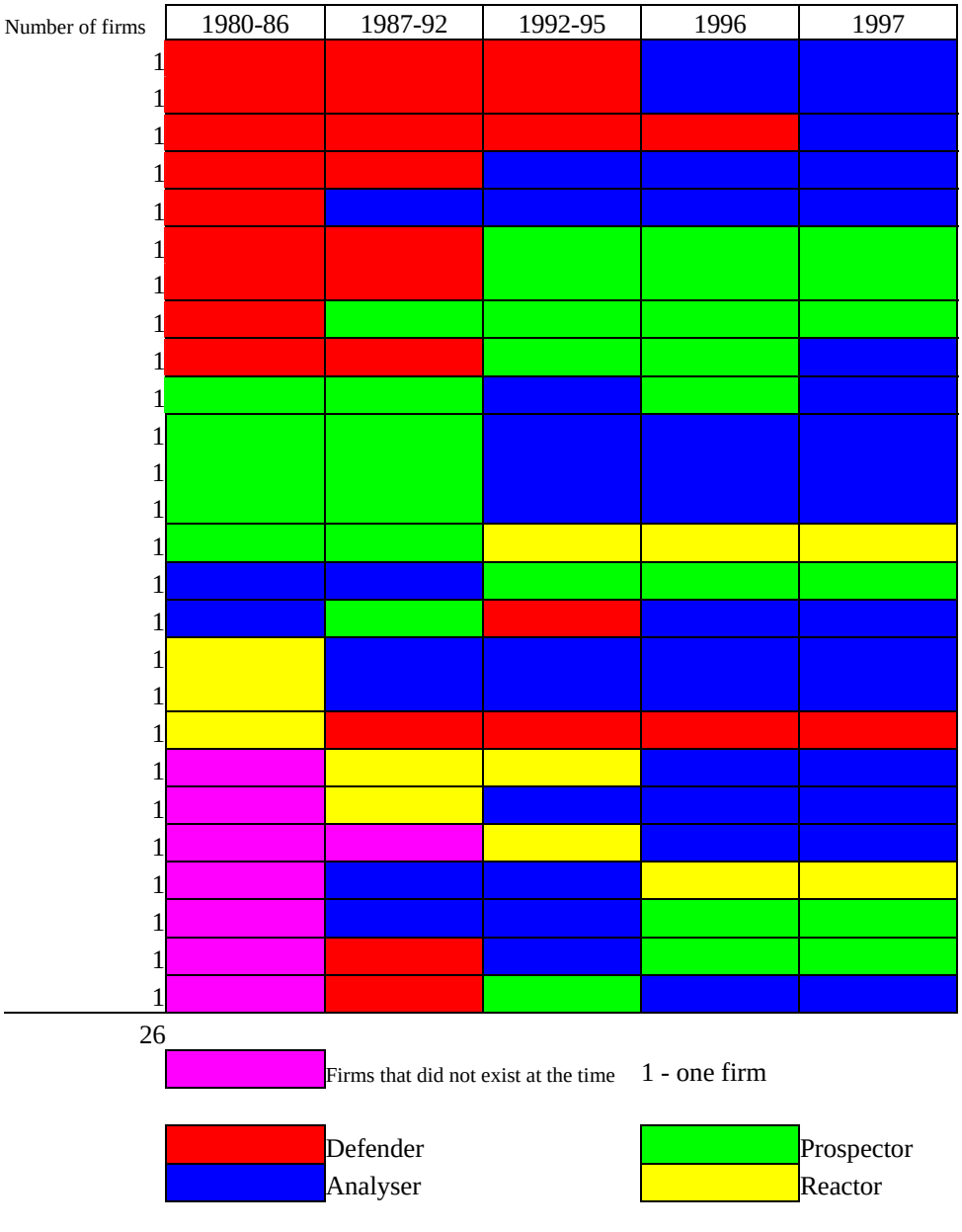
their strategy to Analysers or Prospectors. It is also important to note that the Portuguese mould makers changed their strategy in 1987-92 and 1993-95 (Figure 67), periods of environmental changes.

In summary, while 59% of firms maintained their stance, 41% changed their strategy. As environmental conditions changed, so too did the distribution of firms by type. The research reveals that the change was patterned as the number of Defenders declined and the number of Analysers increased as the environment changed from one of stability to one of turbulence. Firms changed from Defenders to the Analysers - i.e. to those with a balanced strategy. The Defender stance clearly became less defendable in a more turbulent environment. As expected, Analysers were least likely to change their stance as the Analyser type became the dominant form and firms opted for a mix of defensive and innovative positions. Reactors were also found to change their strategic stance and this finding is important because reveals, contrary to the literature, that Reactors are able to change and to strategically re-orientate themselves.

Figure 67 - Frequencies of *Movers'* patterns of change (firms that changed from one specific strategy type to another) for the period 1980- 97

CHANGTYP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	A-P-D-A	1	3,8%	3,8%	3,8%
	A-P	2	7,7%	7,7%	11,5%
	A-R	1	3,8%	3,8%	15,4%
	D-A-P	1	3,8%	3,8%	19,2%
	D-A	5	19,2%	19,2%	38,5%
	D-P-A	2	7,7%	7,7%	46,2%
	D-P	3	11,5%	11,5%	57,7%
	P-A-P-A	1	3,8%	3,8%	61,5%
	P-A	3	11,5%	11,5%	73,1%
	P-R	1	3,8%	3,8%	76,9%
	R-A	5	19,2%	19,2%	96,2%
	R-D	1	3,8%	3,8%	100,0%
	Total	26	100,0%	100,0%	



Are there differences in the business profiles of Stayers and Movers?

It would be expected that firms that change their strategy type would also change their strategic behaviour and that firms that maintain their strategy types would maintain their strategic stance. The analysis explores differences in aggregate, between *Stayer* and *Mover* strategic groups, and then among the strategic groups, explores differences between patterns of *Stayers* and *Movers* for each strategy type. *Stayers* and *Movers* are explored for the capacity and complexity of the manufactured mould, markets, client industries, areas of investment, technological profile, customer benefits offered and the subcontracting policy. As there was only one firm that has been always a Reactor, Reactors were omitted from the analysis.

Are there differences between Stayers and Movers and the capacity and complexity of the manufactured moulds? The findings indicate that *Stayer* and *Mover* strategic groups have chosen a different capacity for mould production: in aggregate, while *Stayer* Prospectors scored significantly higher on very large moulds, and *Stayer* Defenders on medium moulds, *Movers* scored highly on large moulds (see Figure 68). When the patterns of *Stayers* and *Movers* for each strategy type are analysed, firms that moved from Prospectors to Analysers, and from Defenders to Analysers, scored higher than other strategy types on medium and large moulds (see Figure 69). So, *Stayer* Prospectors produce very large moulds and those firms that moved to Analysers, produce medium and large capacity moulds. It is known that it is this production capacity that gives firms the competitive edge and creates barriers to entry into the industry. It is also interesting to see, that among *Movers*, firms that moved from Reactors to Analysers also scored significantly high on the production of very large moulds.

It is interesting to note that from the beginning, *Stayer* Prospectors and Defenders decided to produce very large and medium capacity moulds respectively, and over time they have consistently increased this production capacity. Conversely, *Movers* (Prospectors who became Analysers and Defenders who became Analysers) have over the timescales moved back and forth; there is more uncertainty in their decision. It is

therefore suggested that whereas *Stayer*s maintain their strategy over time and attempt convergent changes in order to adapt to the changing environment, *Movers* follow more radical changes, showing changeability in their strategic stance.

In addition, the analysis reveals that in aggregate, *Stayers* primarily produce highly complex moulds, while *Movers* produce medium complexity moulds (see Figure 70). It seems that *Stayer* Prospectors have chosen, from the beginning (1980-86), to produce highly complex moulds (they have been scoring higher than other strategy types), and over time they have been reinforcing their strategic stance. Once again, they pursue their strategy and, in order to adapt to the changing environment, make convergent adjustments. On the other hand, *Movers*: Defender-Analyser, Prospector-Analyser, Defender-Prospector, or Analyser-Prospector attempted major changes. Over time, and especially after dynamic environments, they moved from low to medium complexity moulds, withdrawing completely in 1996 and 1997 from low complexity (see Figure 71). *Stayers* still produce moulds of low complexity (besides the very low percentage).

Thus the findings reveal, as expected, that *Stayers* and *Movers* have different strategic behaviours and that over time *Stayers* tend to maintain their strategic behaviour and *Movers* tend to change it. If we analyse in conjunction the capacity and complexity of the manufactured mould, it is interesting to see that *Stayer* Prospectors produce very large moulds of high complexity, whereas Defender-Analysers, the *Movers'* dominant strategic group, produce large capacity moulds of medium complexity. It is exactly in these two groups of capacity-complexity segmentation that firms are able to achieve competitive advantages. So it seems to be a good choice to follow the *Stayer* Prospector strategic behaviour, or move from Defender to Analyser.

Figure 68 - Cross-tabulation, differences between *Stayer* and *Mover* strategic groups and the capacity of the manufactured mould, 1980-97

Figure 68A - *Stayers* and *Movers* and the capacity of the manufactured mould 1980-86

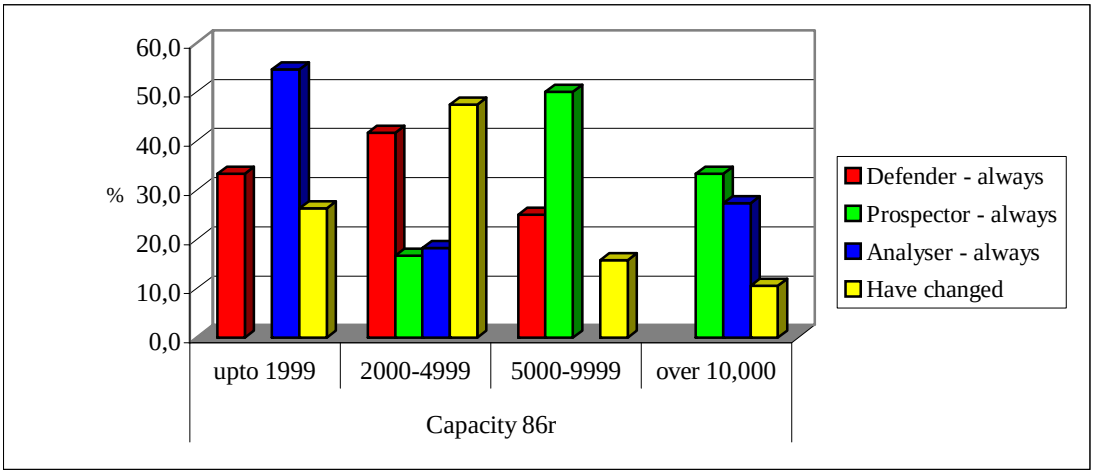


Figure 68B - *Stayers* and *Movers* and the capacity of the manufactured mould 1987-92

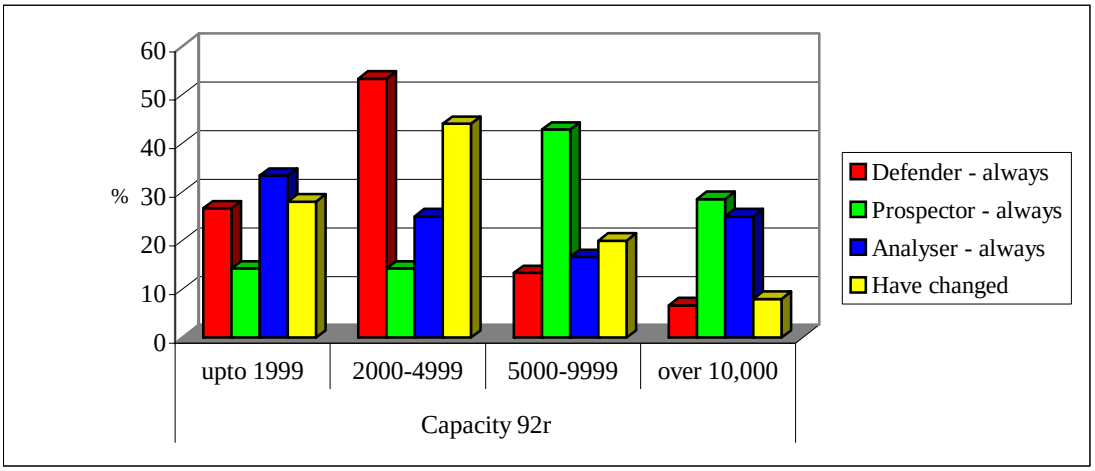


Figure 68C - *Stayers* and *Movers* and the capacity of the manufactured mould 1993-95

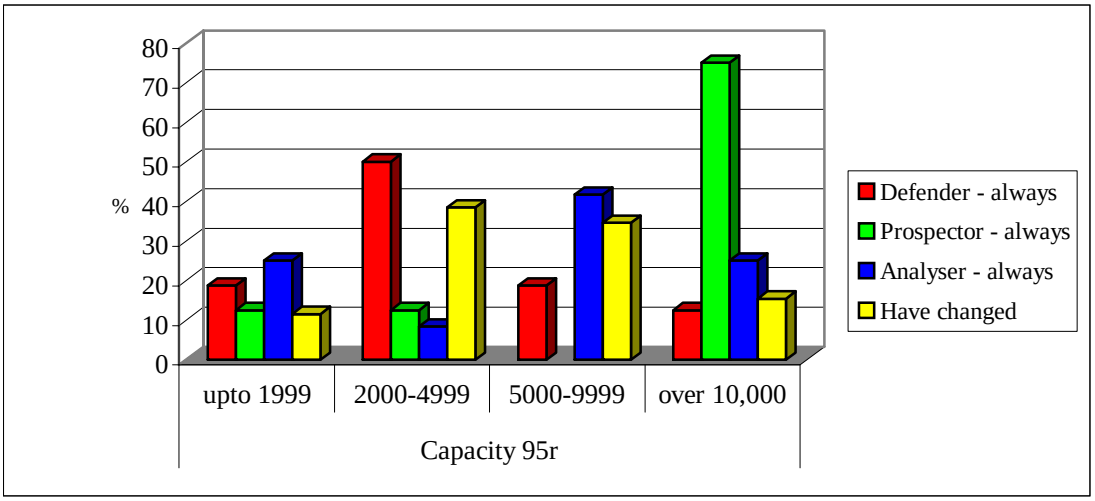


Figure 68 Cont. - Cross-tabulation, differences between *Stayer* and *Mover* strategic groups and the capacity of the manufactured mould, 1980-97

Figure 6D - *Stayers* and *Movers* and the capacity of the manufactured mould 1996

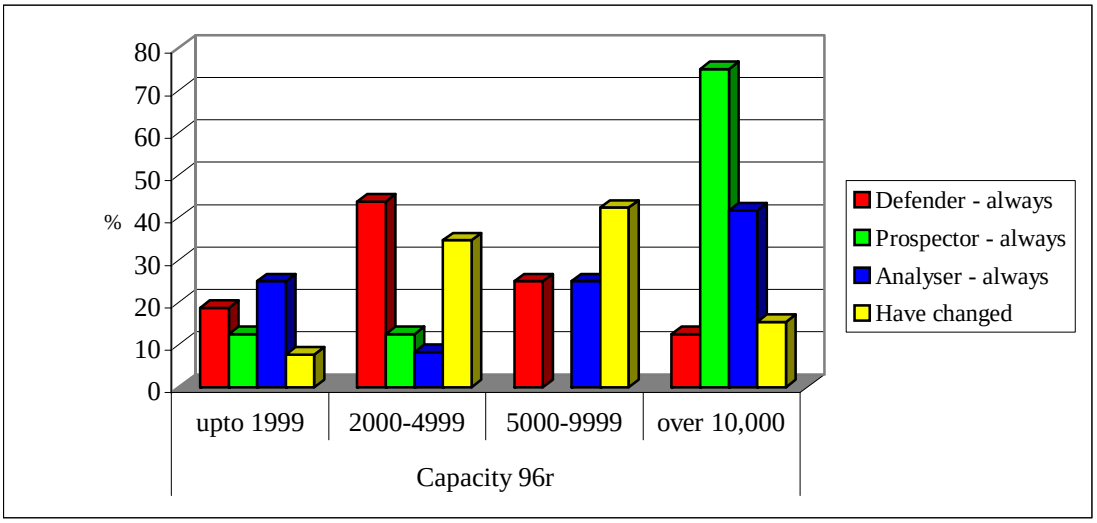


Figure 68E - *Stayers* and *Movers* and the capacity of the manufactured mould 1997

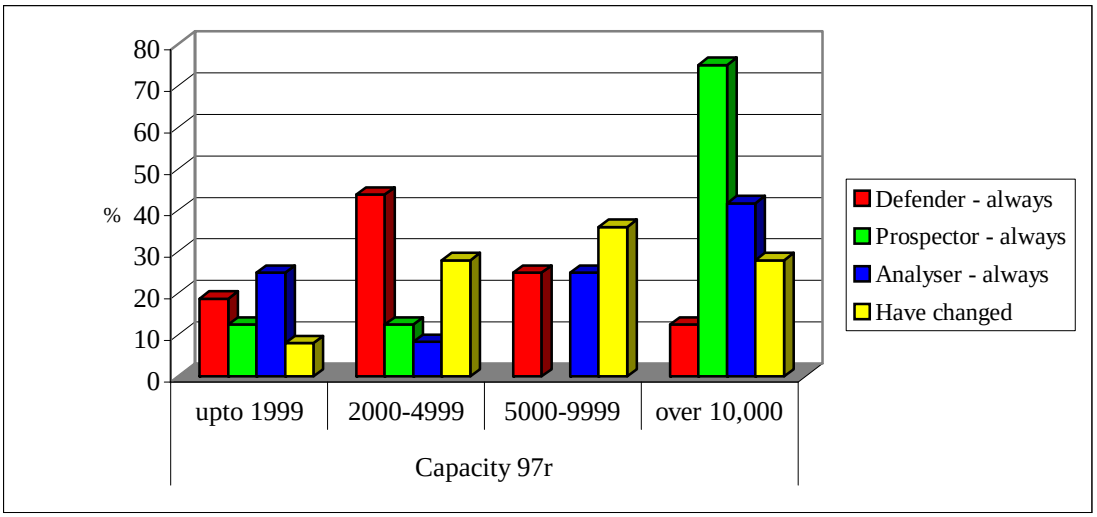


Figure 69 - Cross-tabulation, differences between patterns of *Stayers* and *Movers* for each strategy type, and the capacity of the manufactured mould, 1980-97

Figure 69A - Patterns of *Stayer*s and *Movers,* and the capacity of the manufactured mould, 1980-86

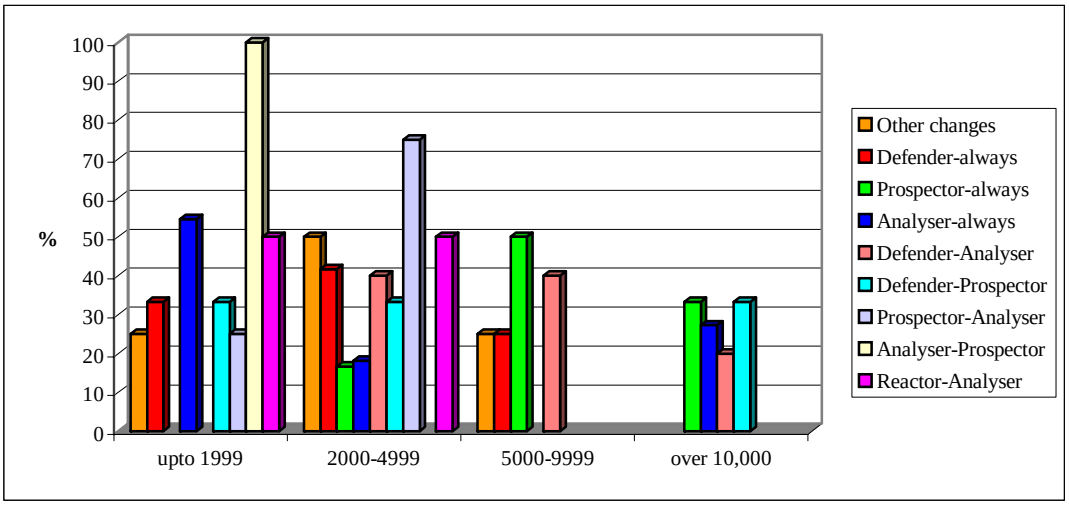


Figure 69B - Patterns of *Stayer*s and *Movers,* and the capacity of the manufactured mould, 1987-92

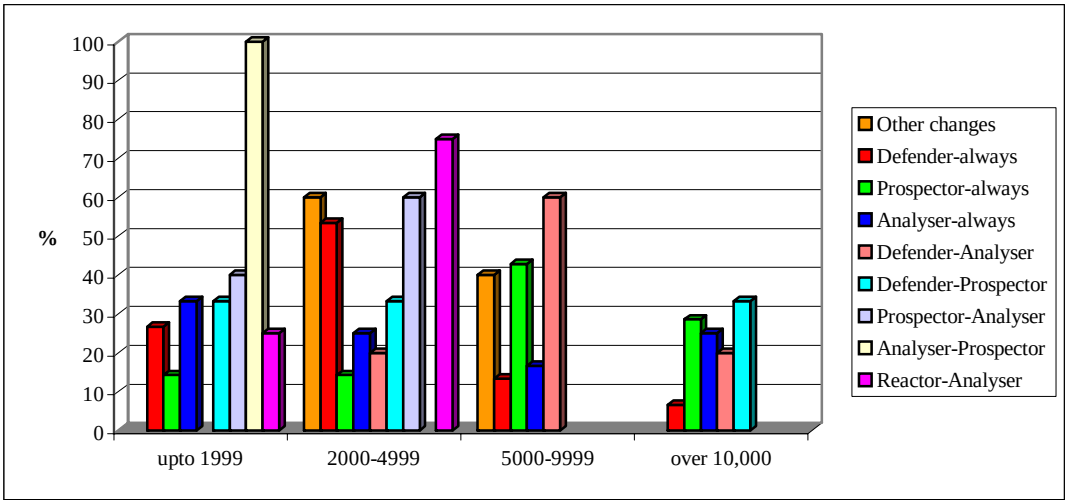


Figure 69C - Patterns of *Stayer*s and *Movers,* and the capacity of the manufactured mould, 1993-95

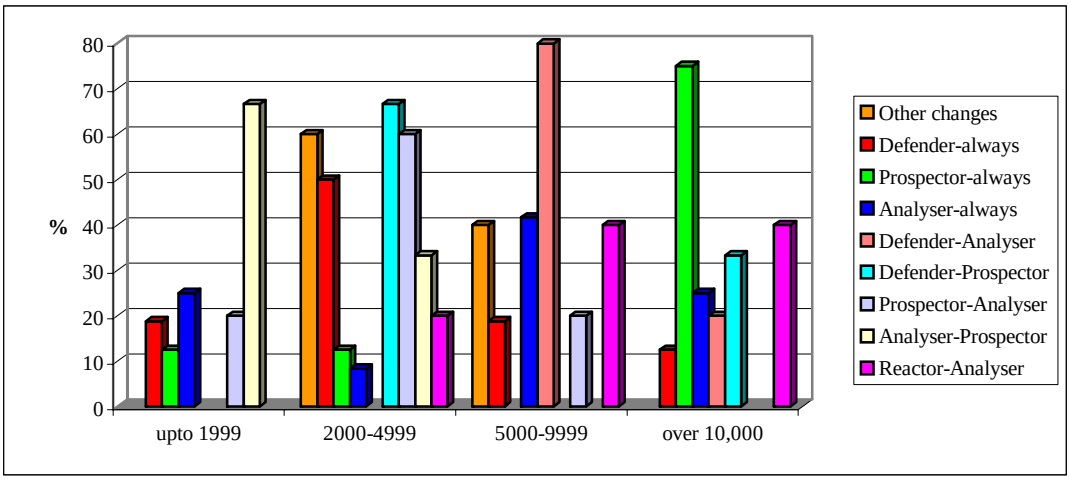


Figure 69 Cont. - Cross-tabulation, differences between patterns of *Stayers* and *Movers* for each strategy type, and the capacity of the manufactured mould, 1980-97

Figure 69D - Patterns of *Stayer*s and *Movers,* and the capacity of the manufactured mould, 1996

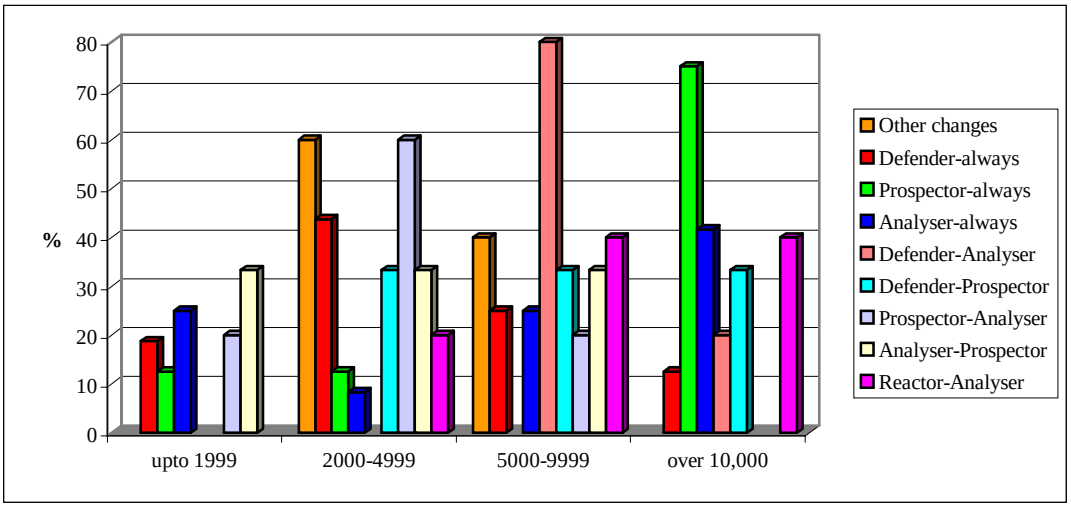


Figure 69E - Patterns of *Stayer*s and *Movers,* and the capacity of the manufactured mould, 1997

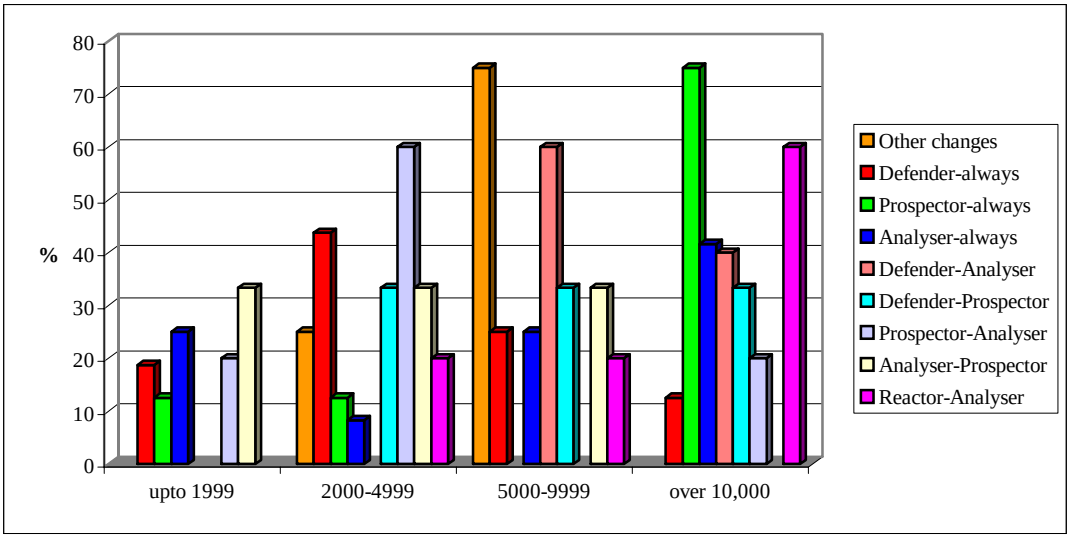


Figure 70 - Cross-tabulation, differences between *Stayer* and *Mover* strategic groups and the complexity of the manufactured mould, 1980-97

Figure 70A - *Stayers* and *Movers* and the complexity of the manufactured mould 1980-86

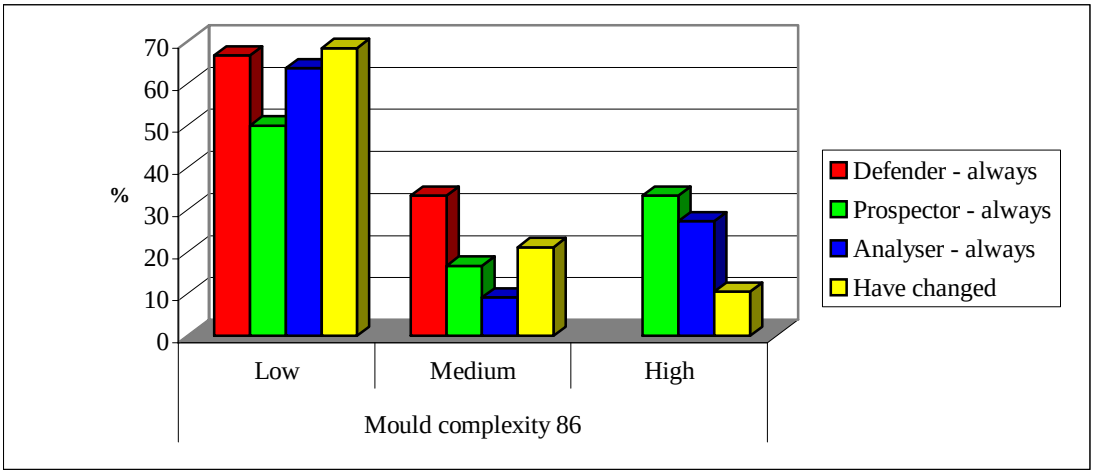


Figure 70B - *Stayers* and *Movers* and the complexity of the manufactured mould 1987-92

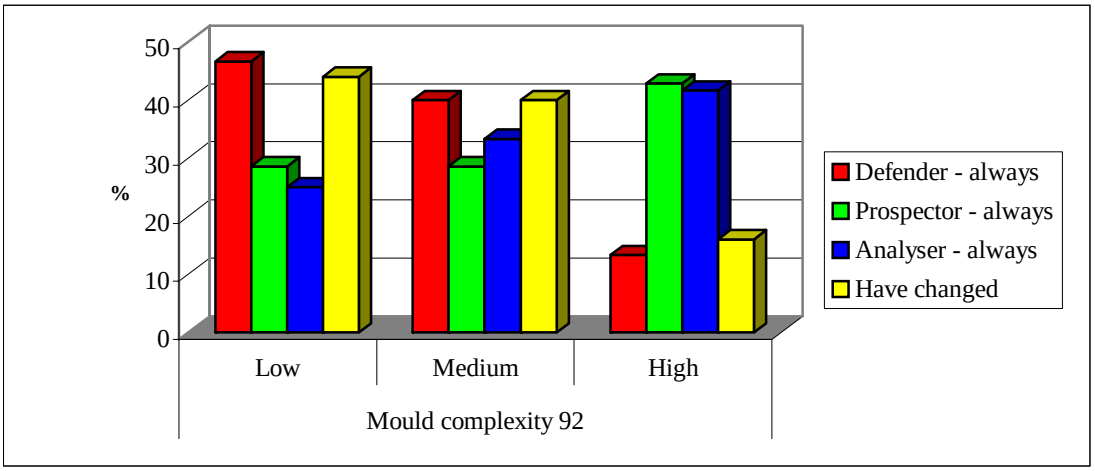


Figure 70C - *Stayers* and *Movers* and the complexity of the manufactured mould 1993-95

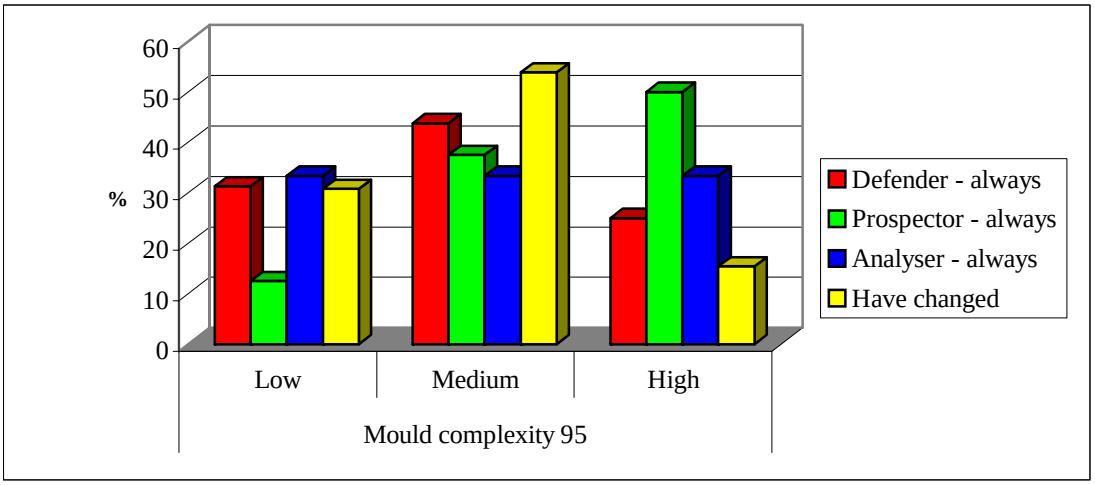


Figure 70 Cont. - Cross-tabulation, differences between *Stayer* and *Mover* strategic groups and the complexity of the manufactured mould, 1980-97

Figure 70D - *Stayers* and *Movers* and the complexity of the manufactured mould 1996

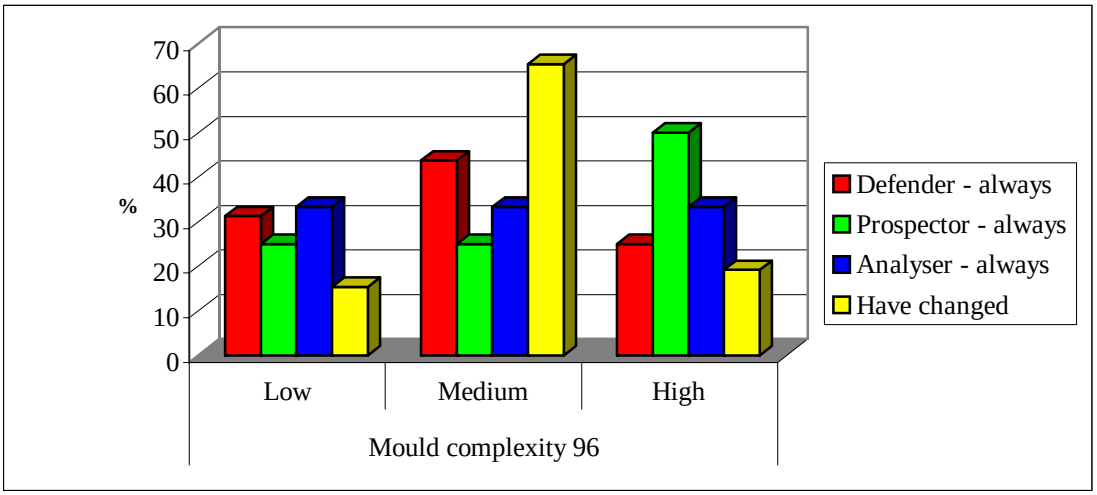


Figure 70E - *Stayers* and *Movers* and the complexity of the manufactured mould 1997

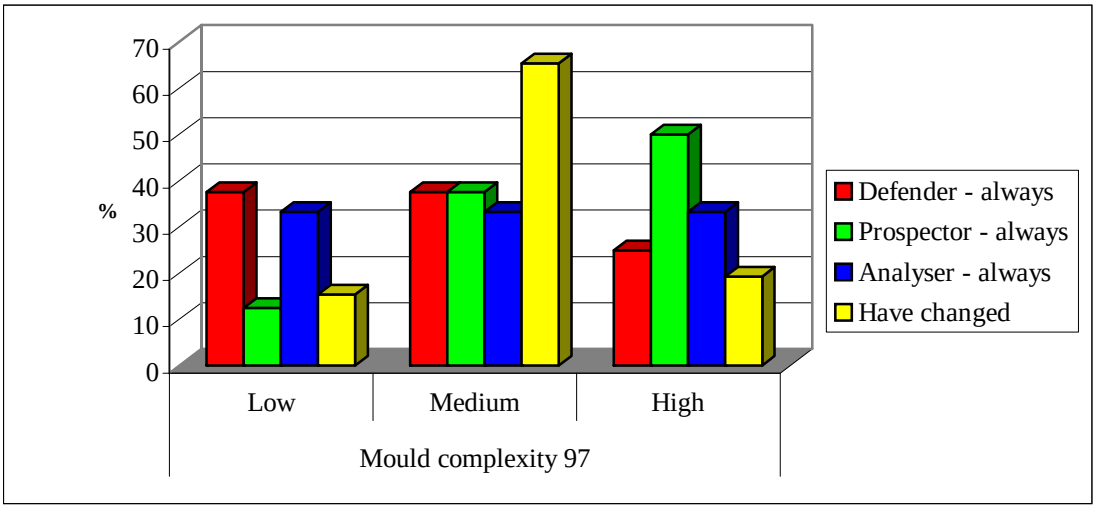


Figure 71 - Cross-tabulation, differences between patterns of *Stayers* and *Movers* for each strategy type, and the complexity of the manufactured mould, 1980-97

Figure 71A - Patterns of *Stayers* and *Movers*, and the complexity of the manufactured mould 1980-86

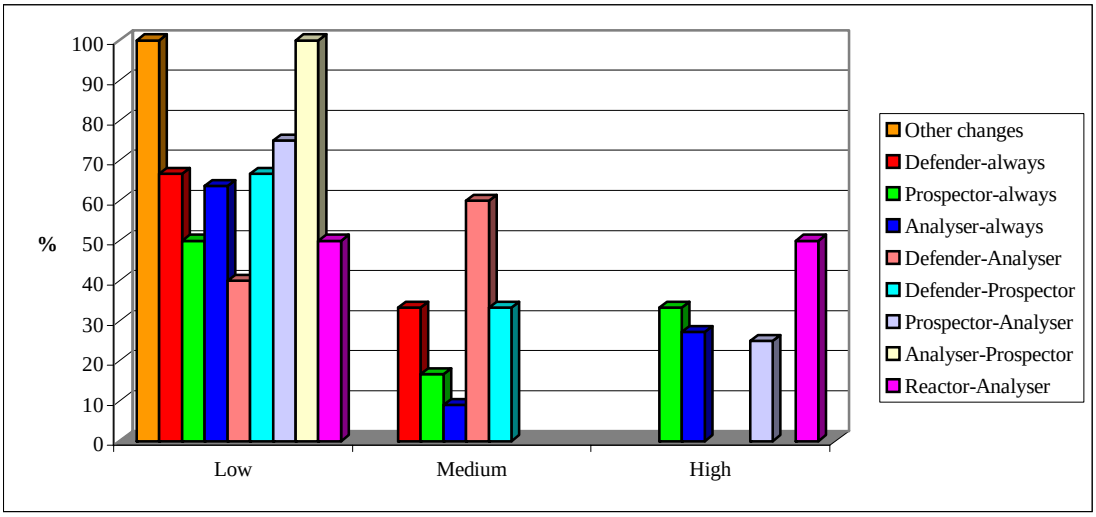


Figure 71B - Patterns of *Stayers* and *Movers*, and the complexity of the manufactured mould 1987-92

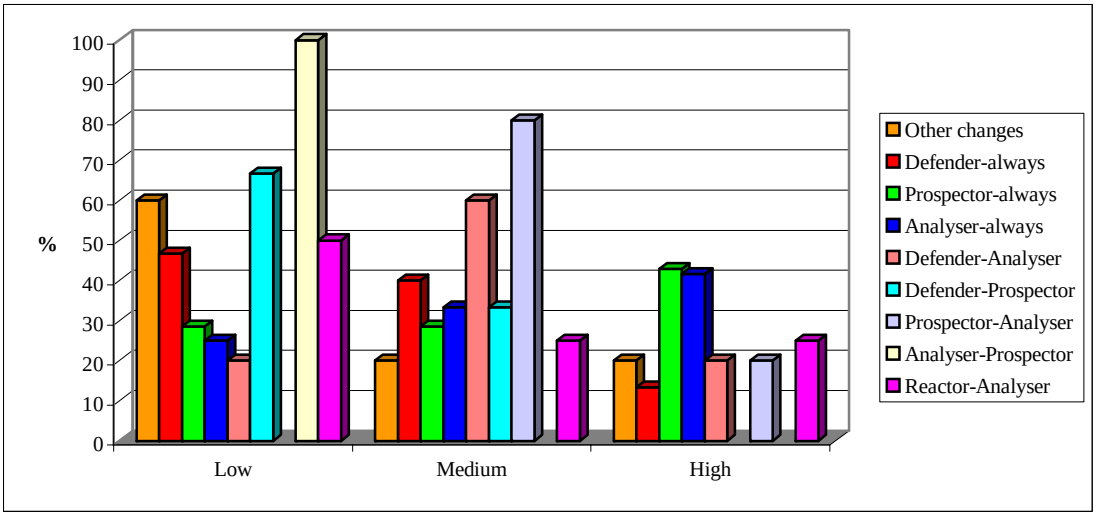


Figure 71C - Patterns of *Stayers* and *Movers*, and the complexity of the manufactured mould 1993-95

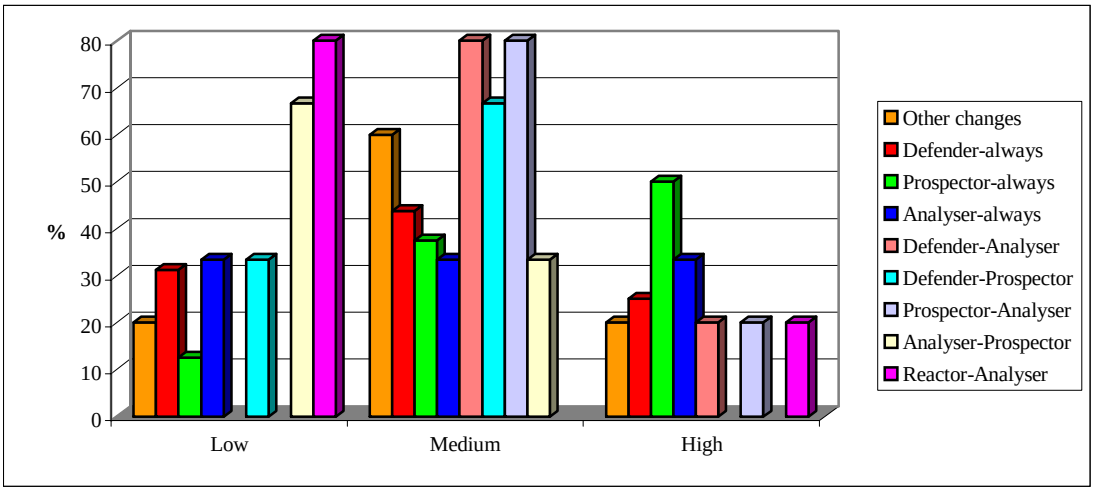


Figure 71 Cont. - Cross-tabulation, differences between patterns of *Stayers* and *Movers* for each strategy type, and the complexity of the manufactured mould, 1980-97

Figure 71D - Patterns of *Stayers* and *Movers*, and the complexity of the manufactured mould 1996

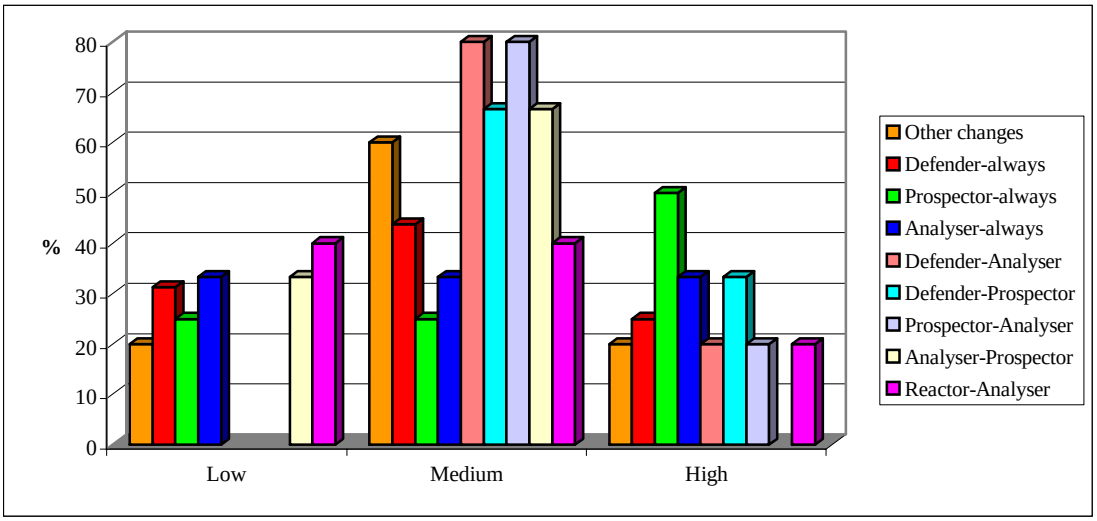
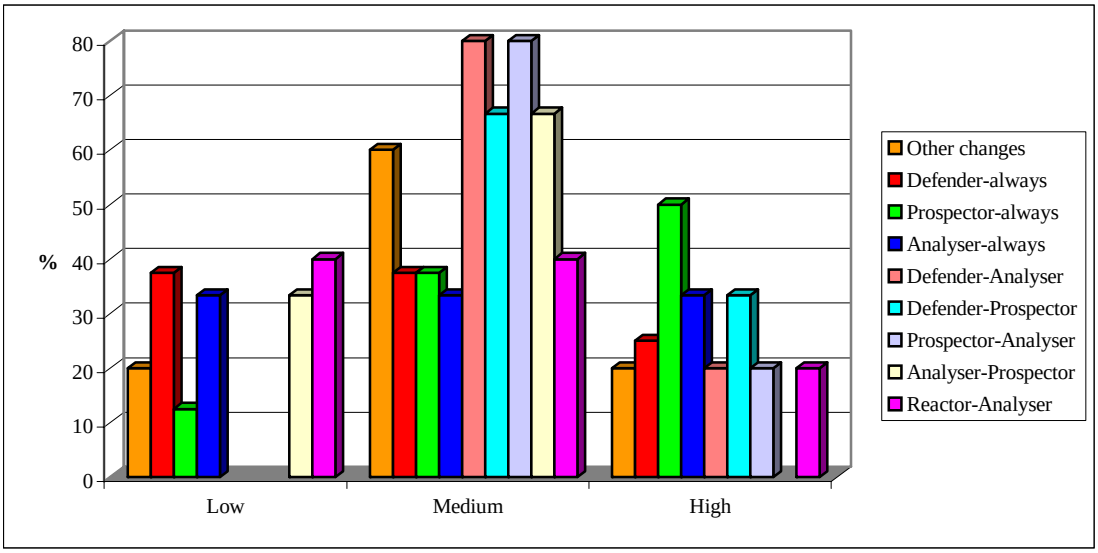


Figure 71E - Patterns of *Stayers* and *Movers*, and the complexity of the manufactured mould 1997



Are there differences between Stayers and Movers and the markets, and the client industries? As expected, in aggregate *Movers* changed the markets to which they were selling more than *Stayers* (see Figure 72). However, *Stayers* clearly lead most of the markets in terms of total sales (*Stayer* Defenders lead the sales to the American, *Stayer* Prospectors to the Brazilian, Dutch, Portuguese, and Swedish, and *Stayer* Analysers to the Israel, British and "other" markets). Only in three markets do *Movers*: Reactors-Analysers (Germany), Defenders-Analysers (Spain) or Analysers-Prospectors (France) lead in terms of sales (see Figure 73). So, maintaining the strategic stance confers the

necessary stability for firms to achieve high market values. Additionally, the analysis shows that as a whole, *Movers* sell significantly to the domestic appliance, "other" and electric/electronic industries, whereas *Stayers* sell to the automotive and domestic utilities industries (see Figure 74). However, when the pattern of *Stayers* and *Movers* for individual types of firm is analysed (see Figure 75), with the exception of Defenders-Prospectors, which lead sales to "other" industries, *Stayers* lead the sales to all client industries (Prospectors, significantly to the automotive and domestic appliance industries, and Defenders to the domestic utilities). It is therefore suggested that following the Prospector strategy (whether *Stayer* Prospector or Defender who moved to Prospector) enables to achieve the highest values of the sectoral markets, i.e. selling to the automotive, domestic appliances and "other" (e.g. medical, pharmaceutical, civil engineering, gardening furniture) industries enables to achieve added value moulds: moulds of large to very large capacity and of medium to high complexity.

Figure 72 - Differences between *Stayer* and *Mover* strategic groups and the markets to which firms have been selling, 1980-96

Figure 72A - *Stayers* and *Movers* and the markets to which firms have been selling 1980-86

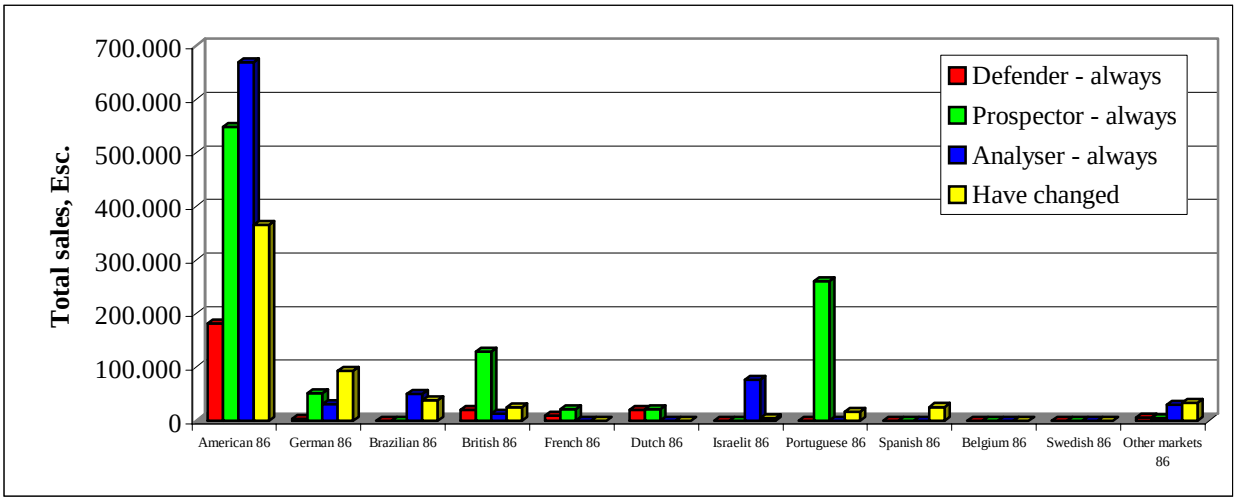


Figure 72 Cont. - Differences between *Stayer* and *Mover* strategic groups and the markets to which firms have been selling, 1980-96

Figure 72B - *Stayers* and *Movers* and the markets to which firms have been selling 1987-92

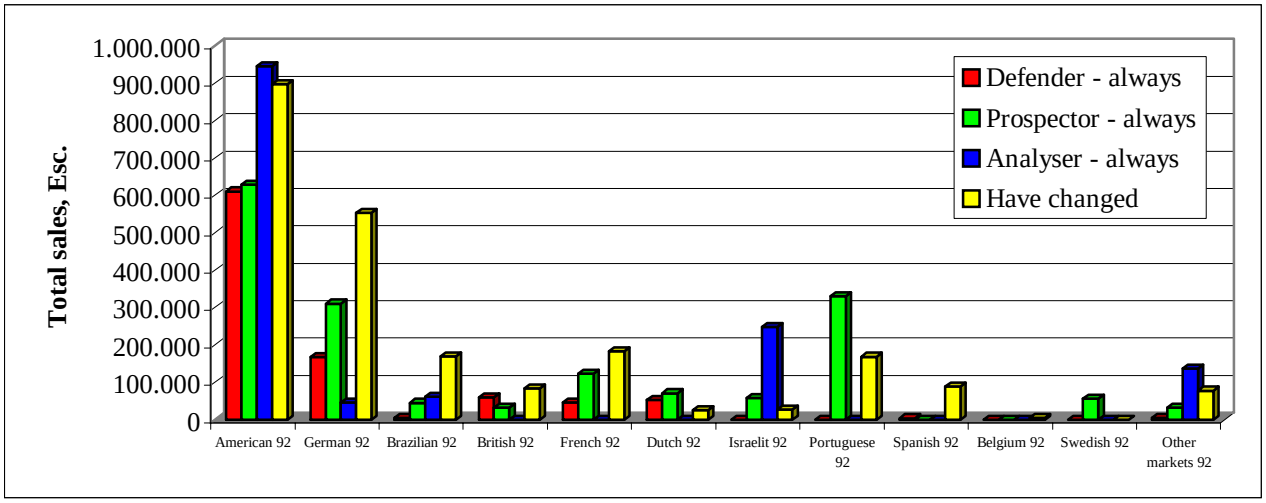


Figure 72C - *Stayers* and *Movers* and the markets to which firms have been selling 1993-95

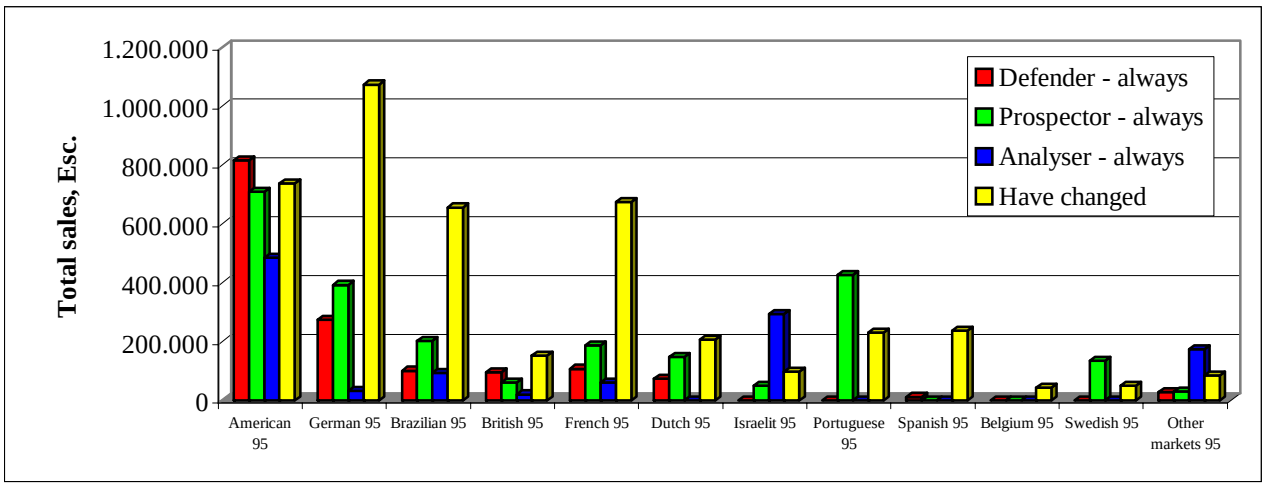


Figure 72D - *Stayers* and *Movers* and the markets to which firms have been selling 1996

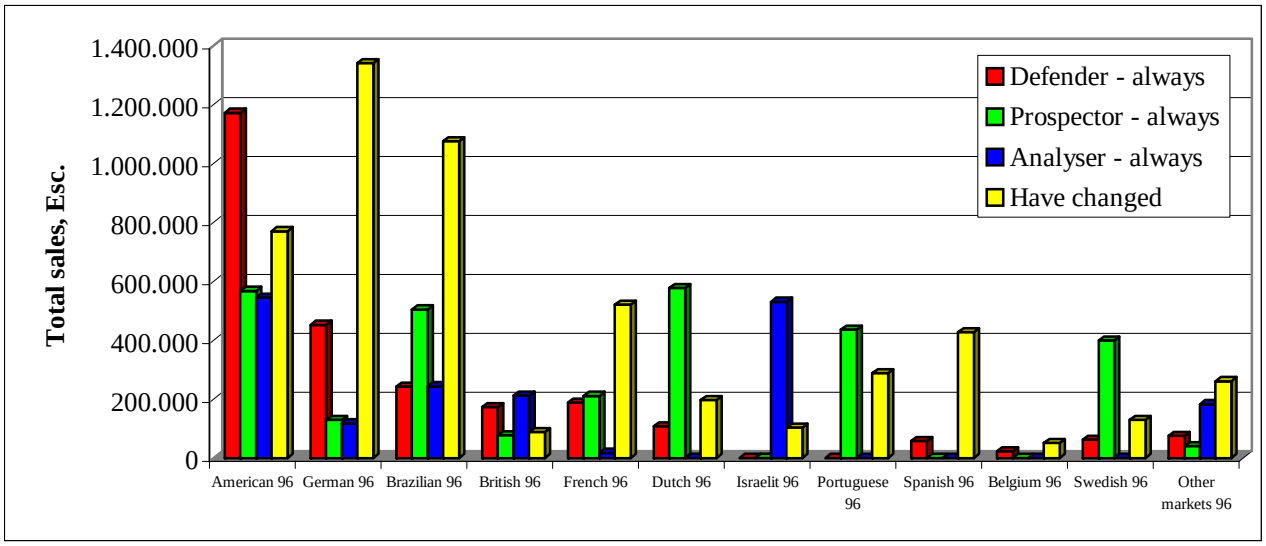


Figure 73 - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the markets to which firms have been selling, 1980-96

Figure 73A - Patterns of *Stayers* and *Movers*, and the markets to which firms have been selling 1980-86

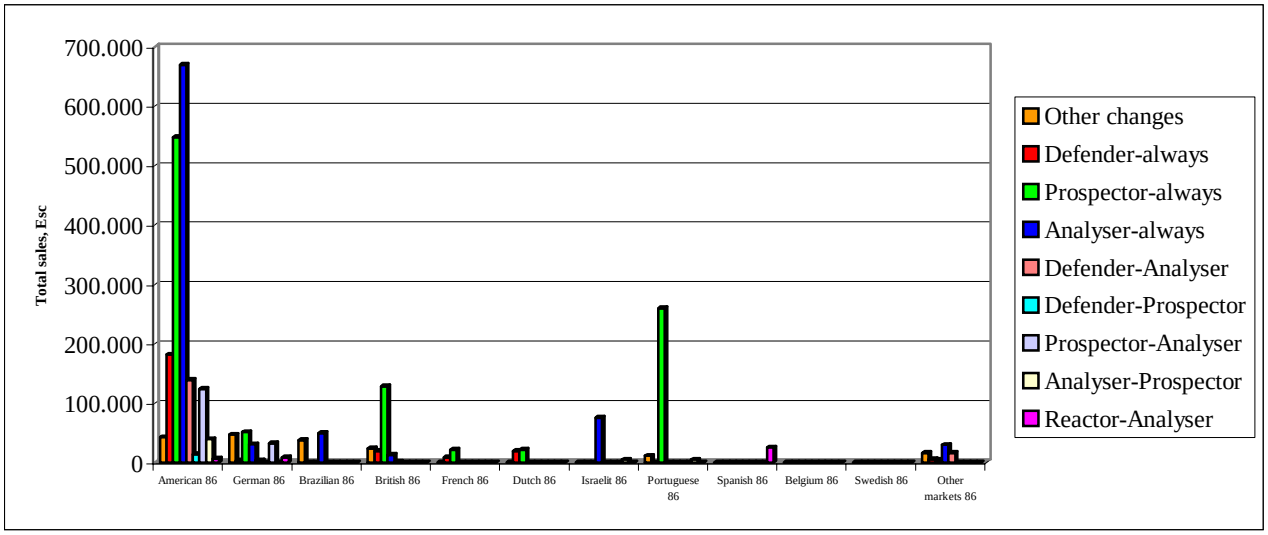


Figure 73B - Patterns of *Stayers* and *Movers*, and the markets to which firms have been selling 1987-92

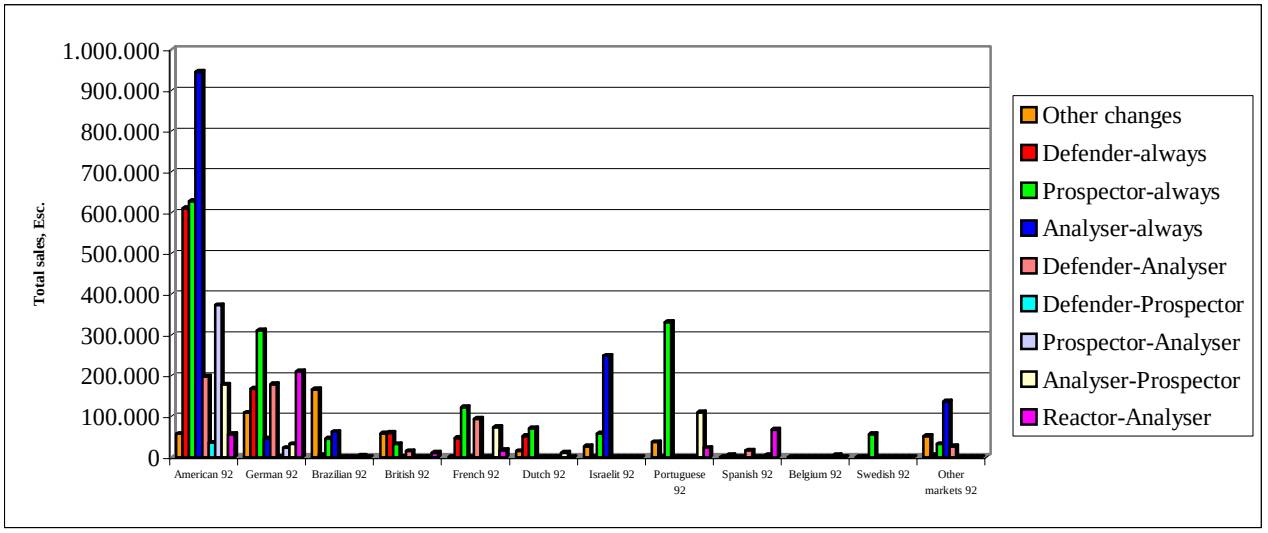


Figure 73C - Patterns of *Stayers* and *Movers*, and the markets to which firms have been selling 1993-95

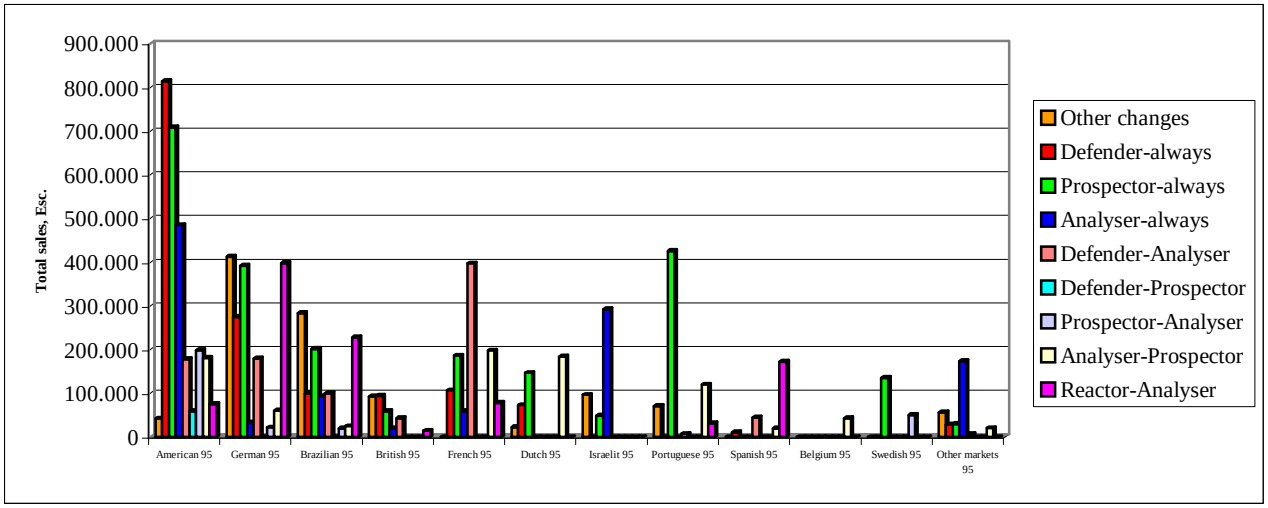


Figure 73 Cont. - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the markets to which firms have been selling, 1980-96

Figure 73D - Patterns of *Stayers* and *Movers*, and the markets to which firms have been selling 1996

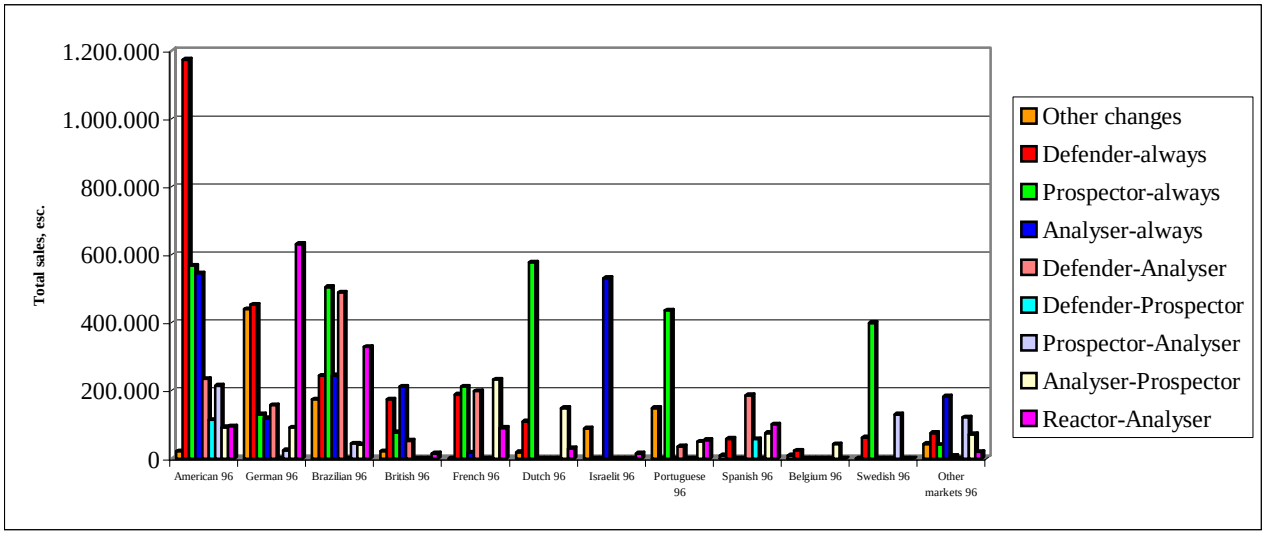


Figure 74 - Differences between *Stayer* and *Mover* strategic groups and the client industries, 1980-96

Figure 74A - *Stayers* and *Movers* and the client industries, 1980-86

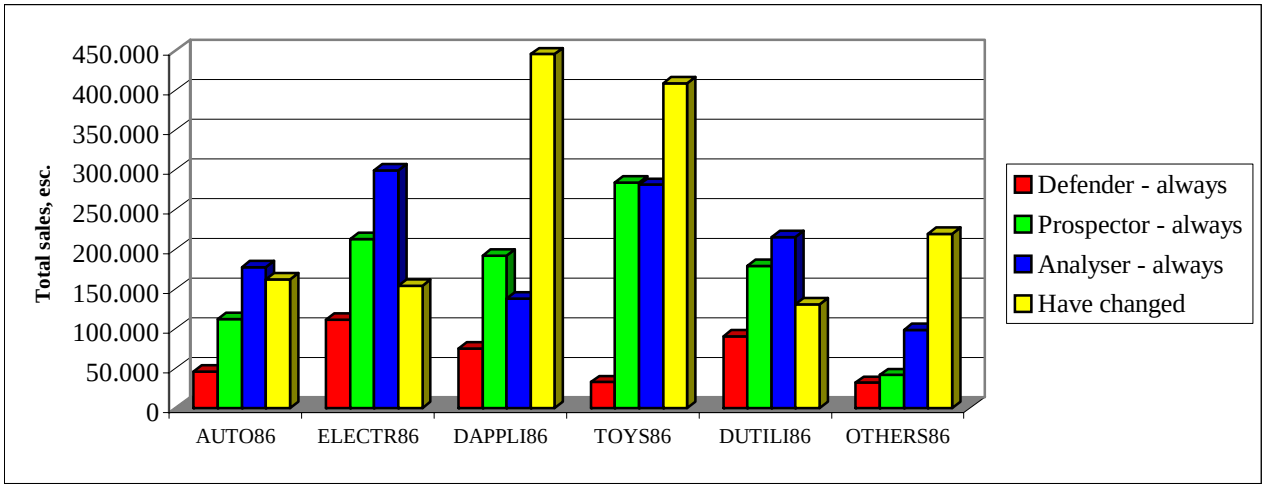


Figure 74 Cont. - Differences between *Stayer* and *Mover* strategic groups and the client industries, 1980-96

Figure 74B - *Stayers* and *Movers* and the client industries, 1987-92

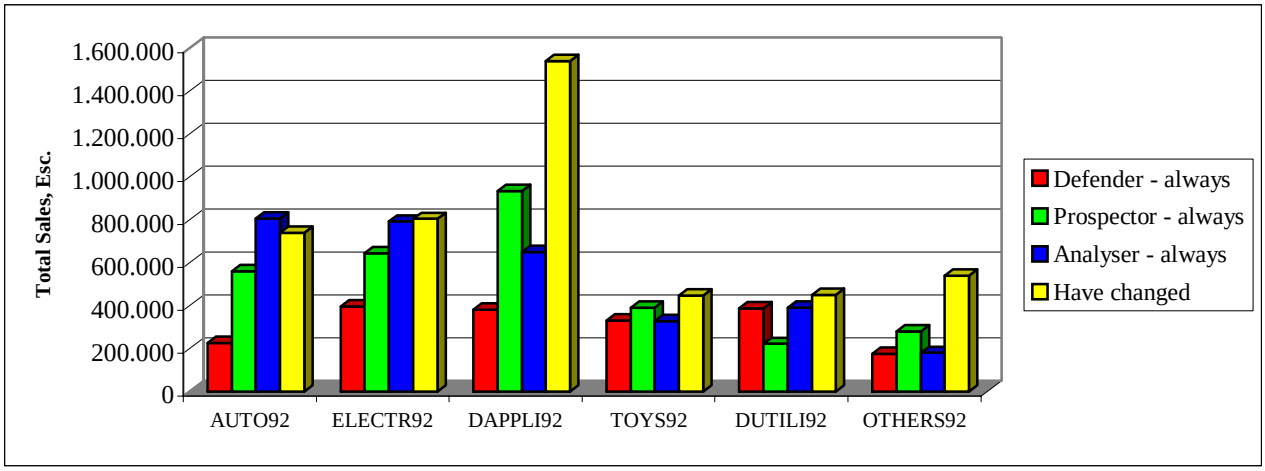


Figure 74C - *Stayers* and *Movers* and the client industries, 1993-95

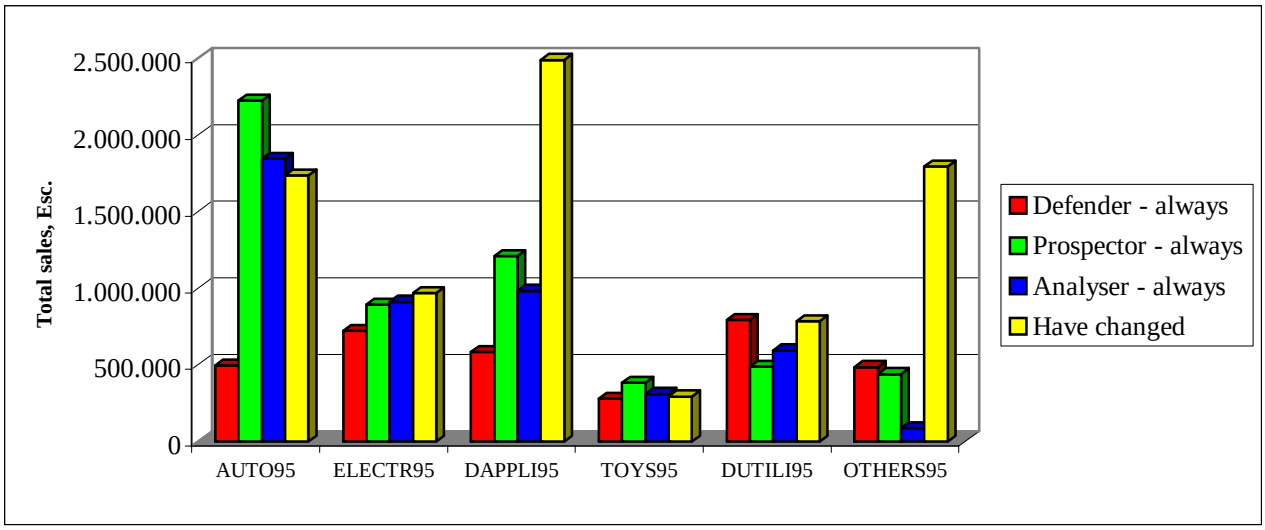


Figure 74D - *Stayers* and *Movers* and the client industries, 1996

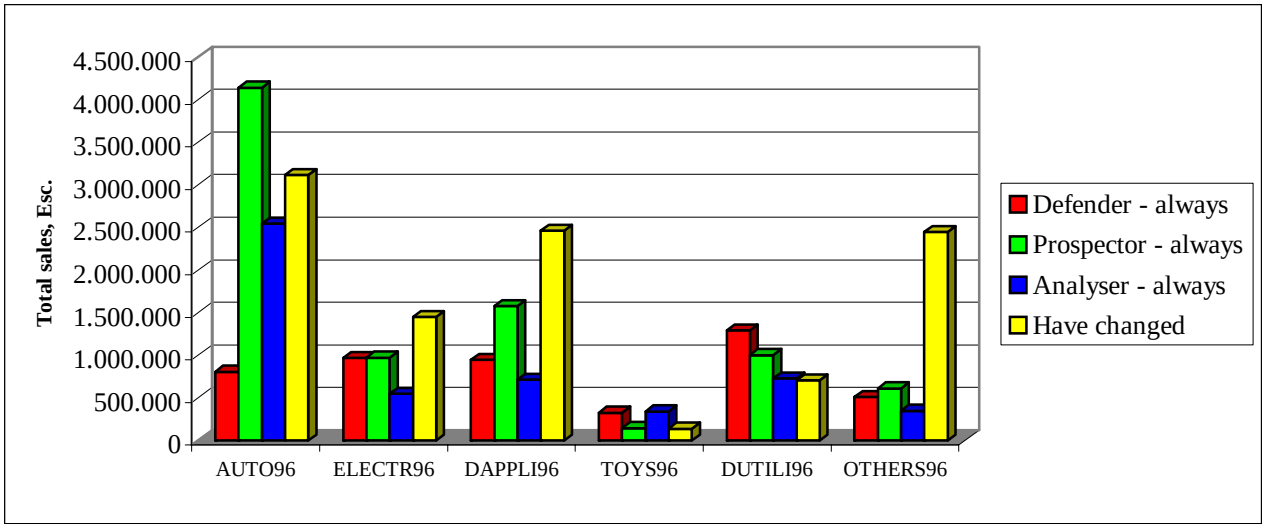


Figure 75 - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the industry clients, 1980-96

Figure 75A - Patterns of *Stayers* and *Movers*, and the industry clients, 1980-86

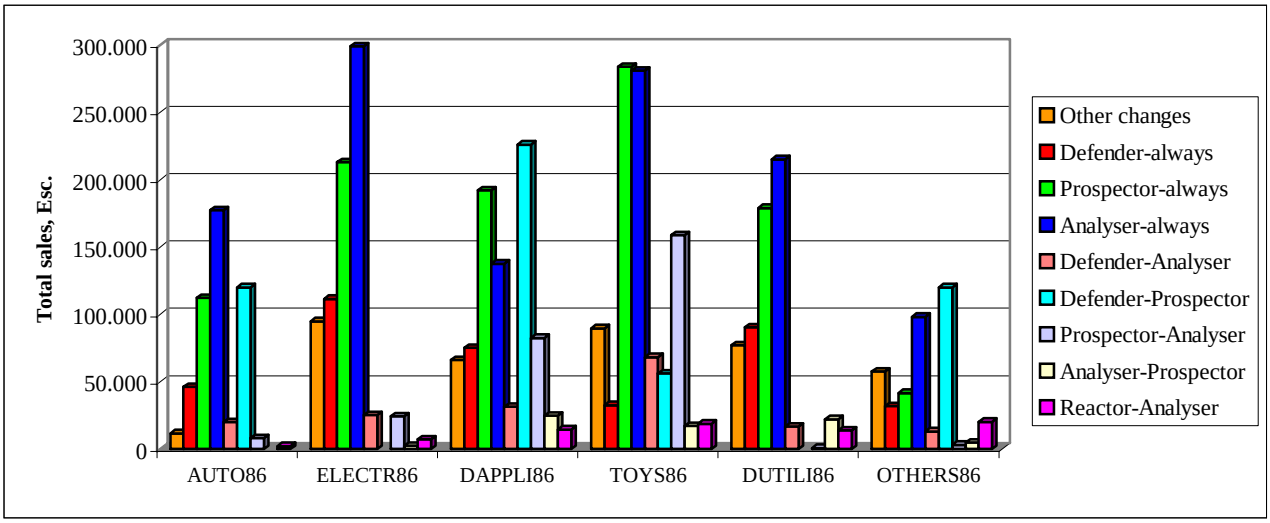


Figure 75B - Patterns of *Stayers* and *Movers*, and the industry clients, 1987-92

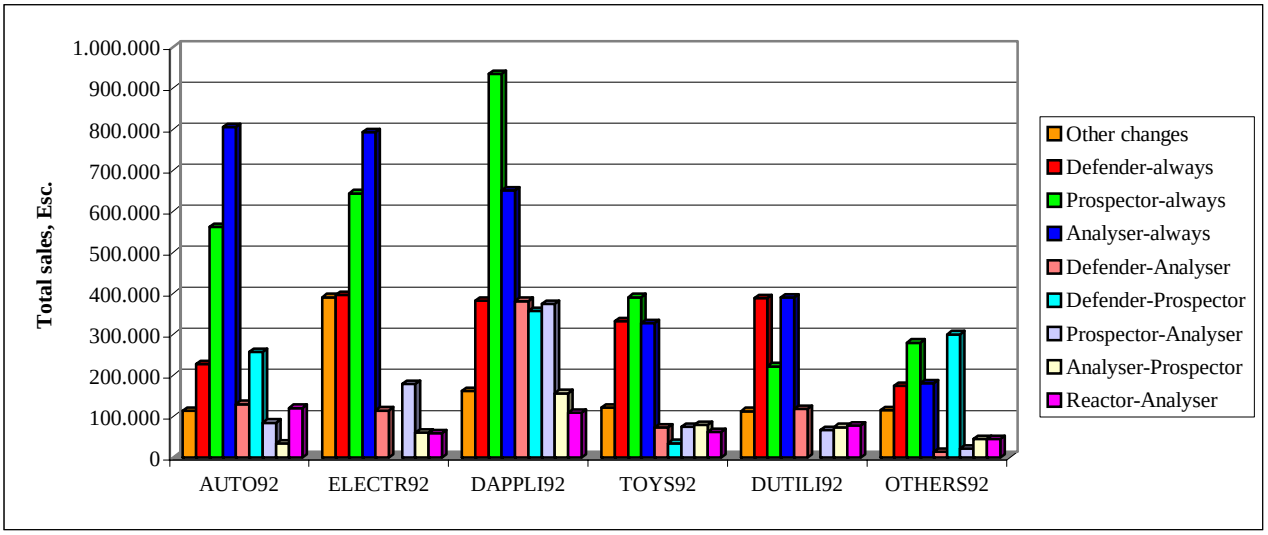


Figure 75C - Patterns of *Stayers* and *Movers*, and the industry clients, 1993-95

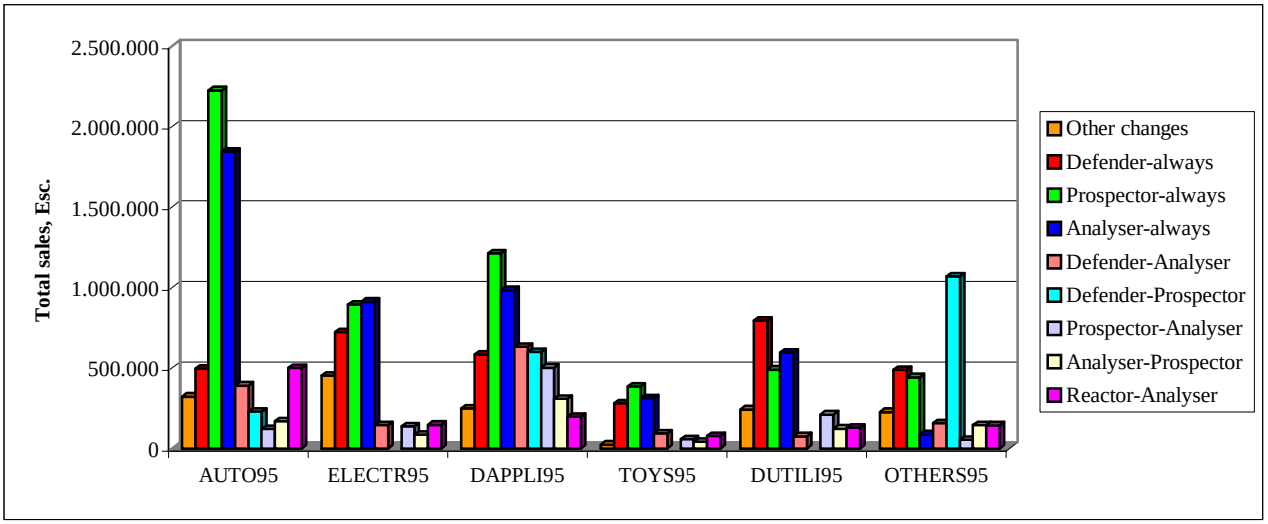
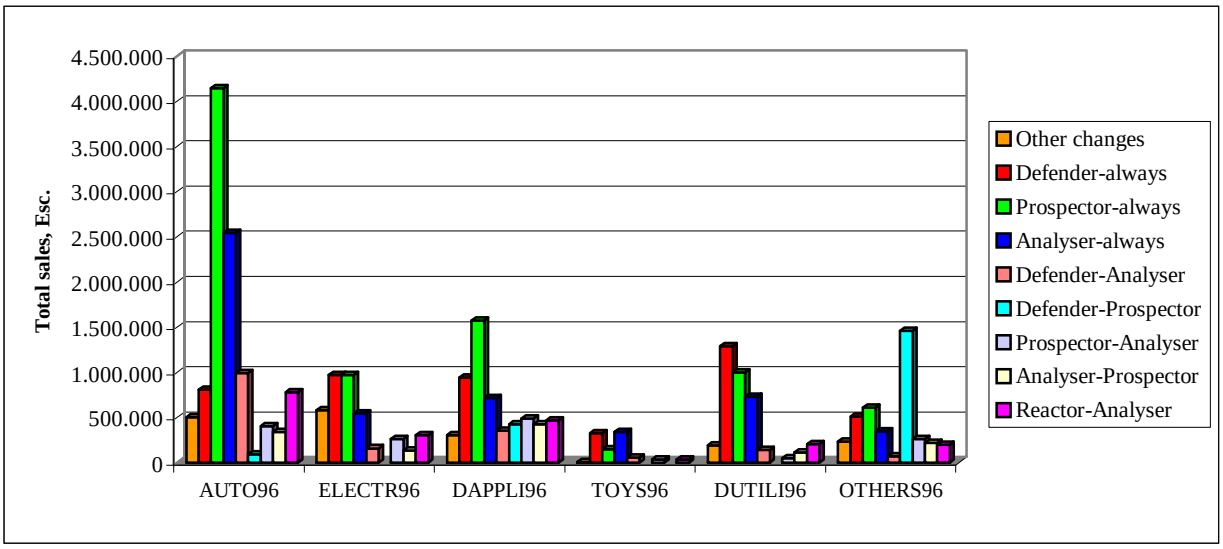


Figure 75 Cont. - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the industry clients, 1980-96

Figure 75D - Patterns of *Stayers* and *Movers*, and the industry clients, 1996



Are there differences between Stayers and Movers and the areas of investment and the technological profile? In aggregate *Movers* invested more than *Stayers* (see Figure 76). However when patterns of the *Stayers* and *Movers* for each strategy type, are analysed, the findings reveal (see Figure 77) that *Stayer* Prospectors have significantly invested higher values in all areas of investment (e.g. in R&D, technology, infrastructures, marketing, customer relationships and training). It is interesting to note that *Movers*, Defenders who became Prospectors, can also be distinguished by their investments. Hence, Prospectors (whether *Stayer* Prospectors or Defenders-Prospectors) invested more. These investments might be expected to lead to higher levels of organisational performance. Furthermore, the overall results indicate that *Stayers* tend to maintain their technological investments, and over time reinforce their technological profile, whereas *Movers* often change their technological priorities for each timescale, showing indecisiveness in their strategic stance (see Figure 78). As in the areas of investment, Prospectors (whether *Stayer* Prospectors or firms that moved from Defenders to Prospectors) invested significantly more in their technology than any other strategy type. A Prospector may confer any kind of competitive advantage (see Figure 79).

Figure 76 - Differences between *Stayer* and *Mover* strategic groups and the areas of investment, 1980-96

Figure 76A - *Stayers* and *Movers* and the areas of investment, 1980-86

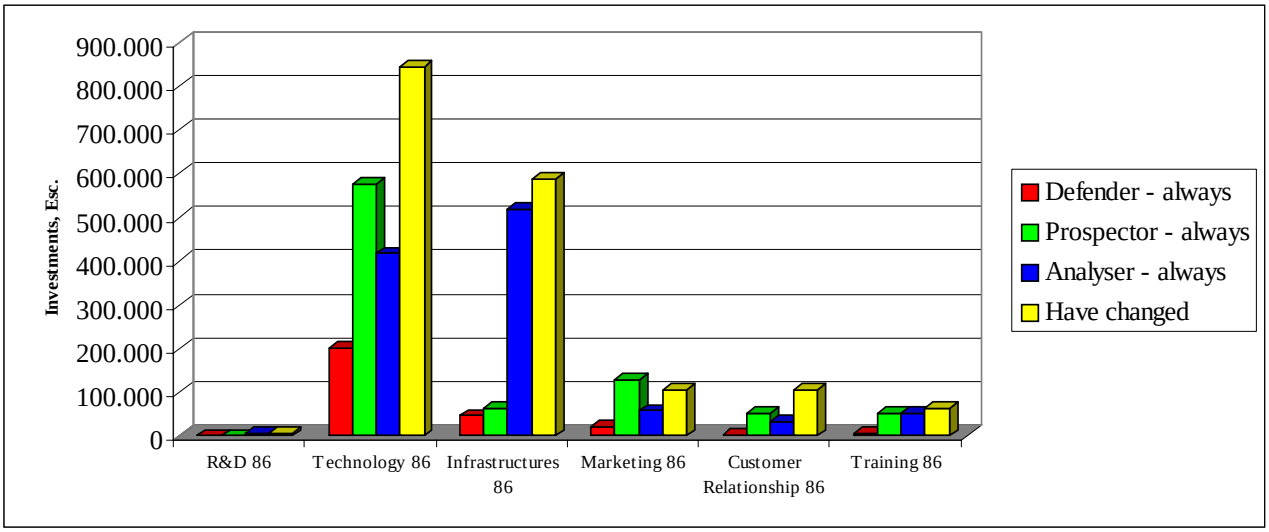


Figure 76B - *Stayers* and *Movers* and the areas of investment, 1987-92

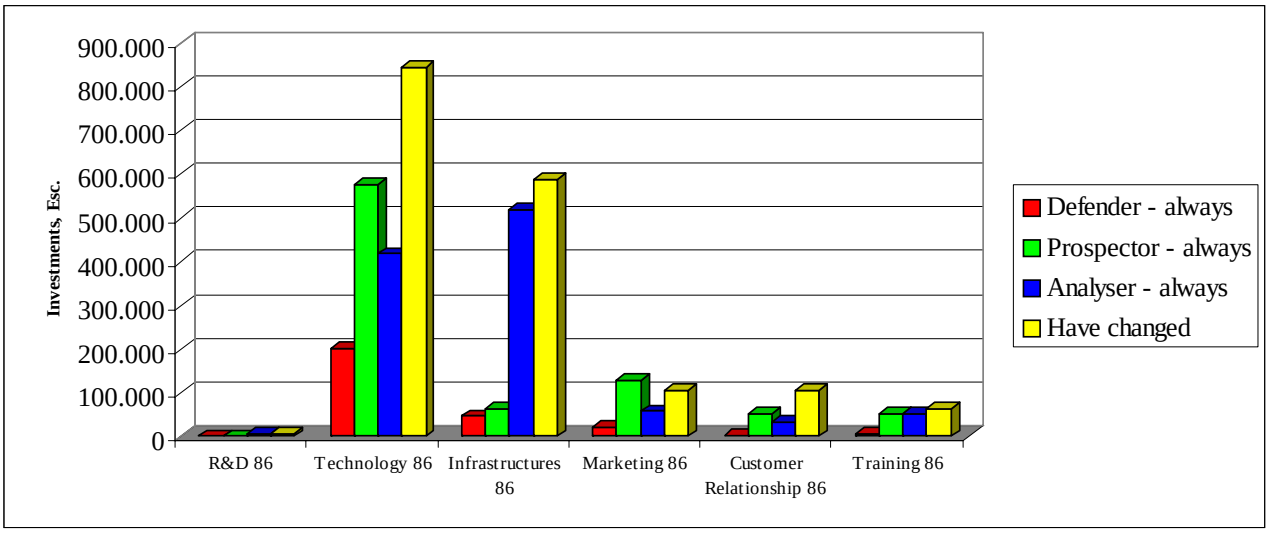


Figure 76C - *Stayers* and *Movers* and the areas of investment, 1993-95

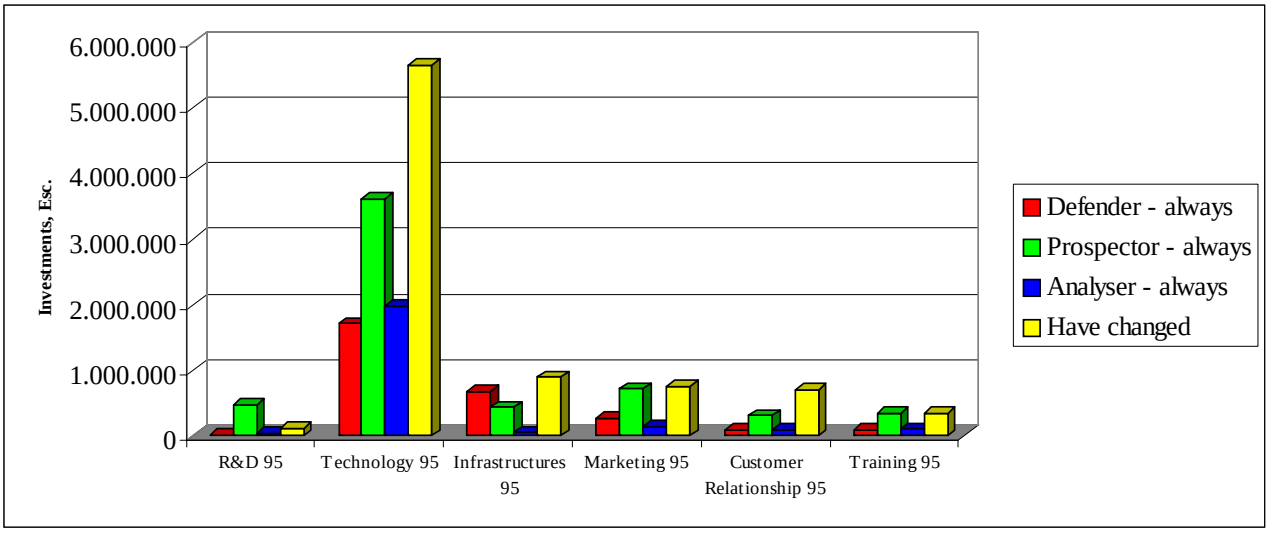


Figure 76 Cont. - Differences between *Stayer* and *Mover* strategic groups and the areas of investment, 1980-96

Figure 76D - *Stayers* and *Movers* and the areas of investment 1996

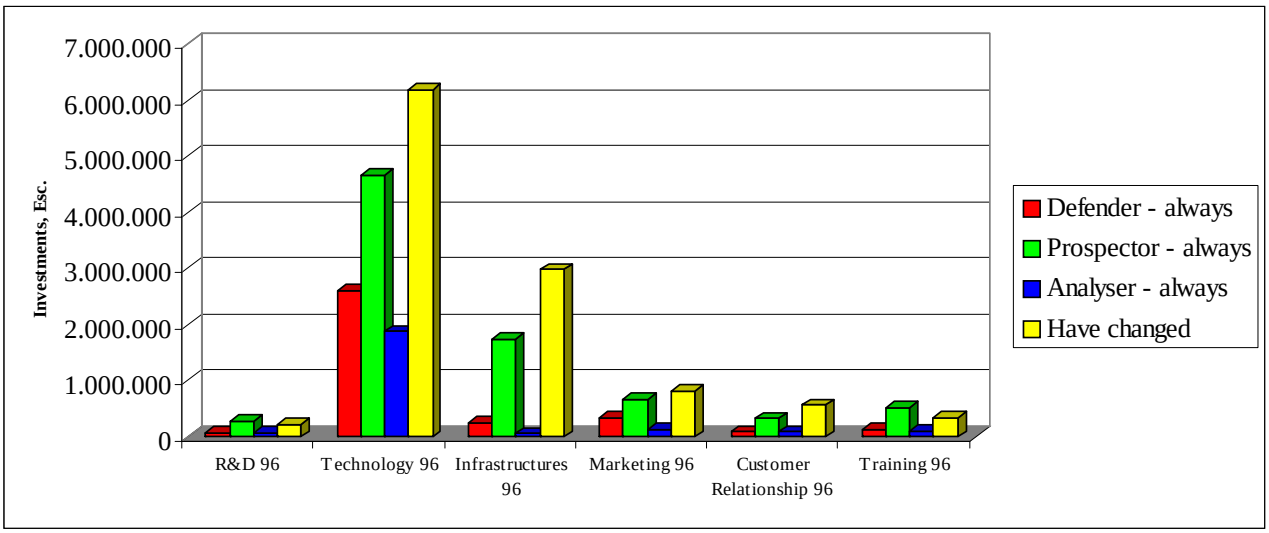


Figure 77 - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the areas of investment, 1980-96

Figure 77A - Patterns of *Stayers* and *Movers*, and the areas of investment, 1980-86

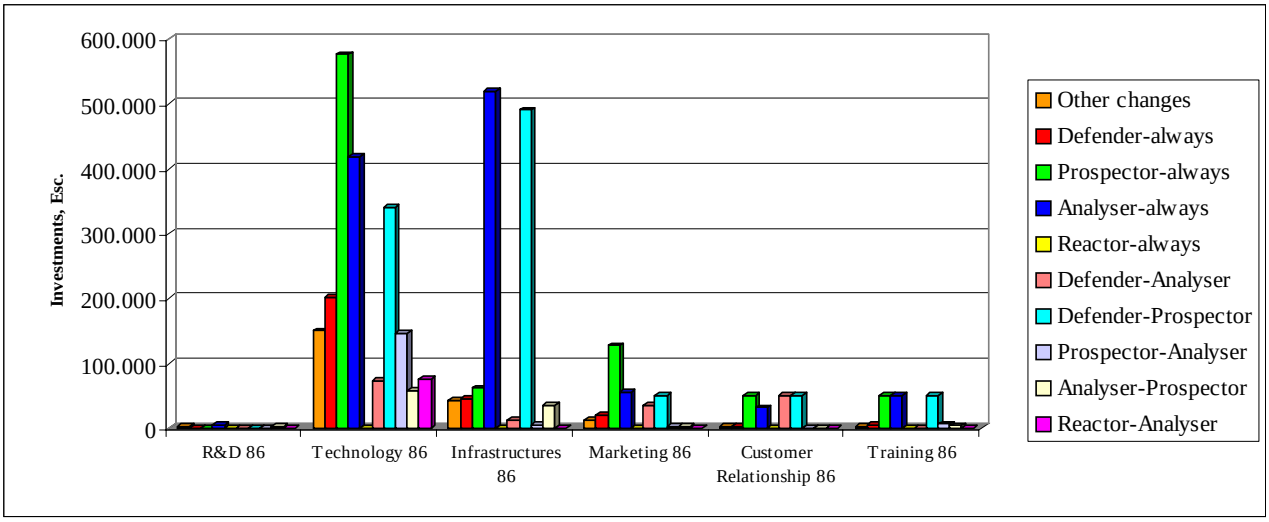


Figure 77 Cont. - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the areas of investment, 1980-96

Figure 77B - Patterns of *Stayers* and *Movers*, and the areas of investment, 1987-92

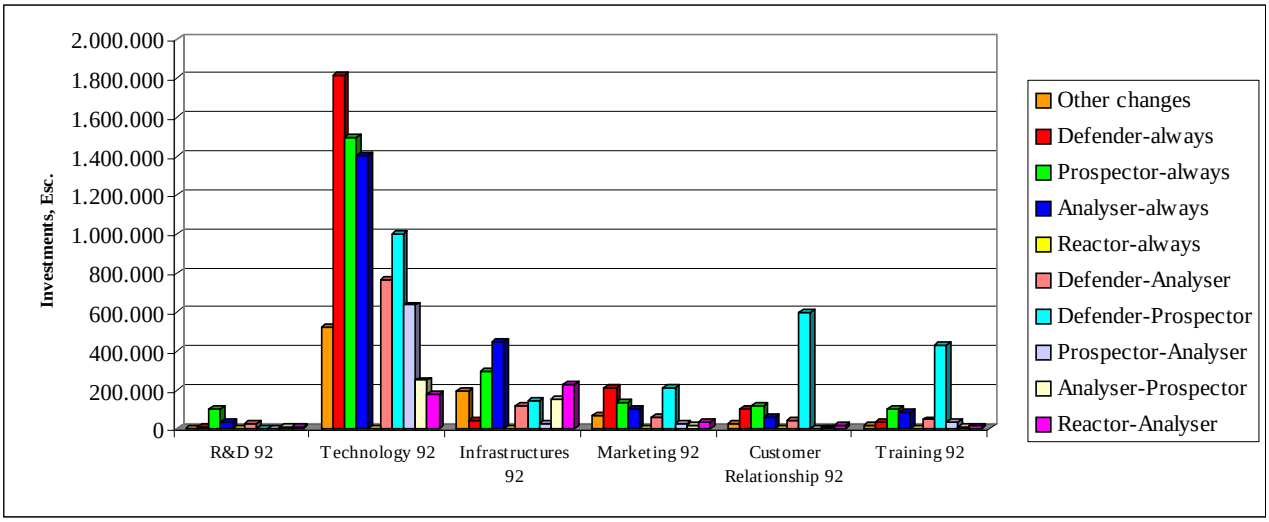


Figure 77C - Patterns of *Stayers* and *Movers*, and the areas of investment, 1993-95

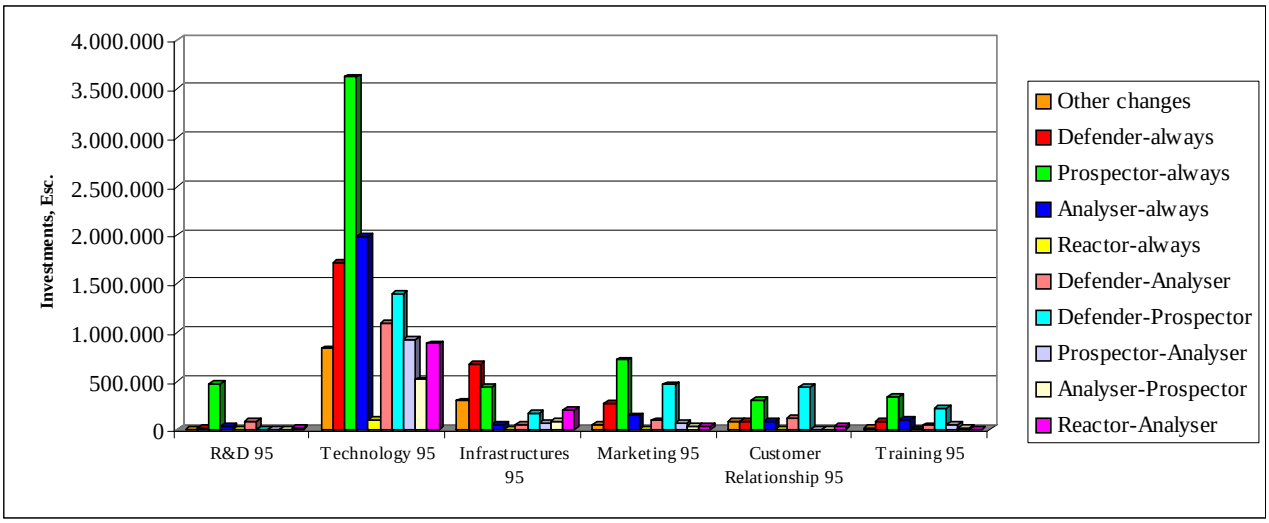


Figure 77D - Patterns of *Stayers* and *Movers*, and the areas of investment, 1996

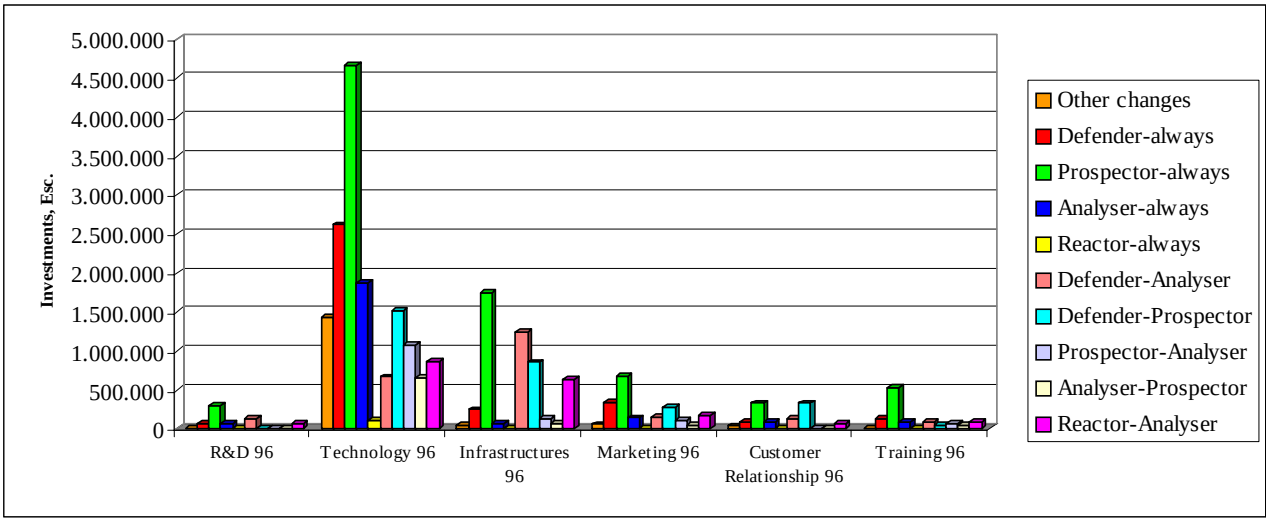


Figure 78 - Differences between *Stayer* and *Mover* strategic groups and technological investments, 1980-96

Figure 78A - *Stayers* and *Movers* and the technology in which firms invested, 1980-86

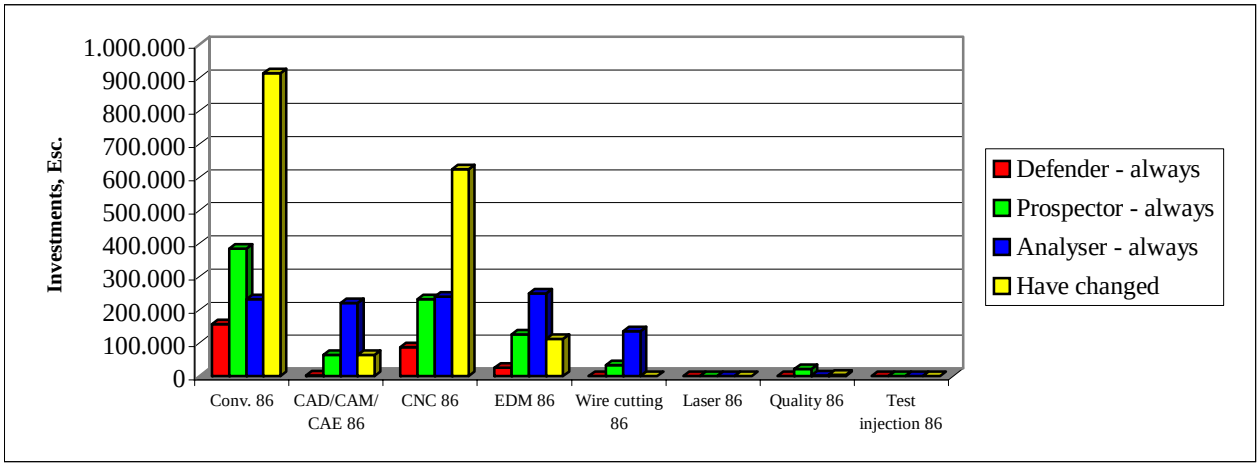


Figure 78B - *Stayers* and *Movers* and the technology in which firms invested, 1987-92

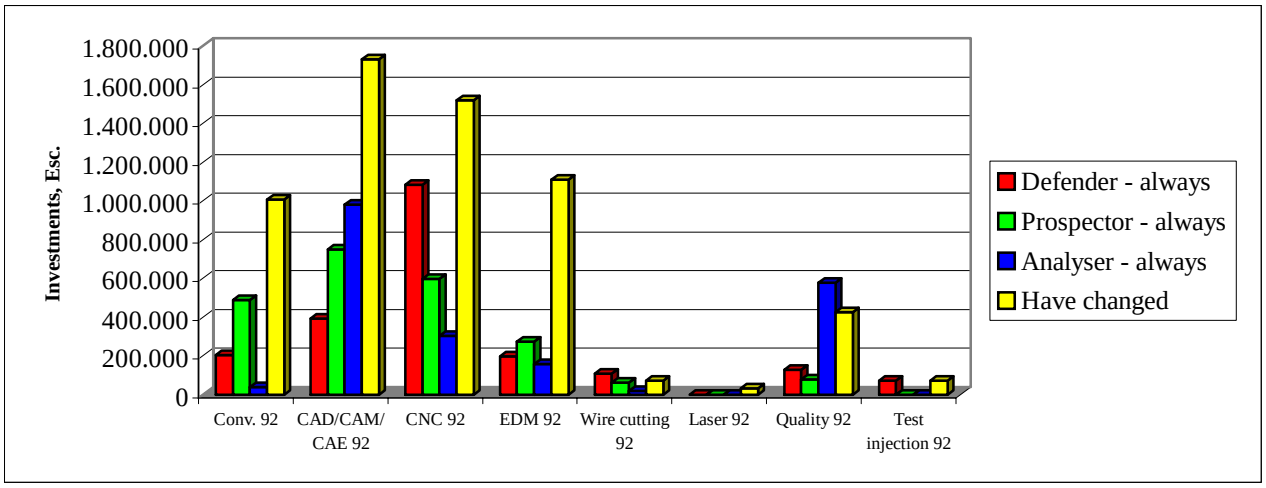


Figure 78C - *Stayers* and *Movers* and the technology in which firms invested, 1993-95

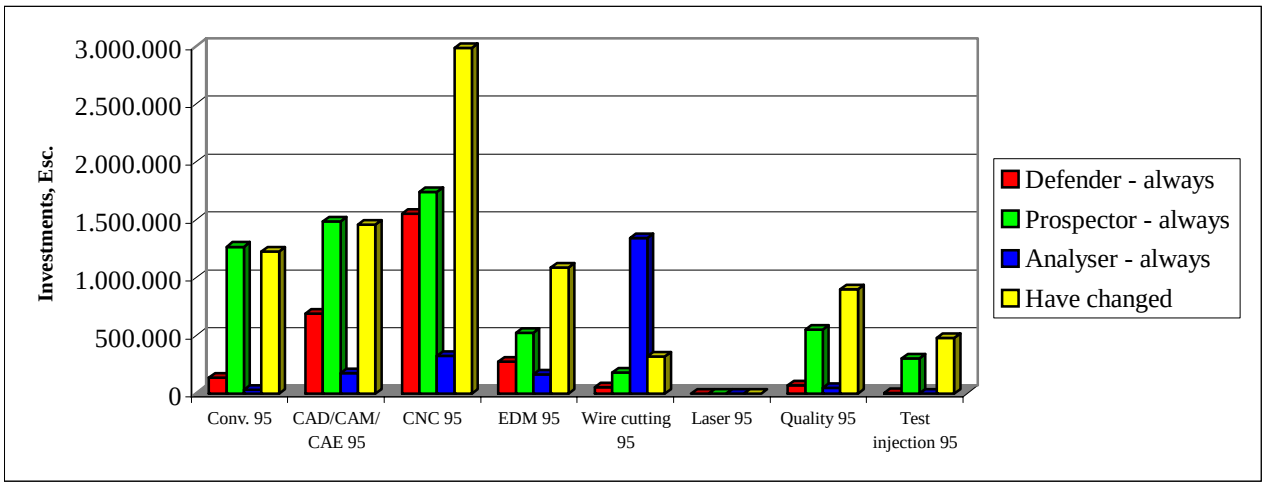


Figure 78 Cont. - Differences between *Stayer* and *Mover* strategic groups and technological investments, 1980-96

Figure 78D - *Stayers* and *Movers* and the technology in which firms invested, 1996

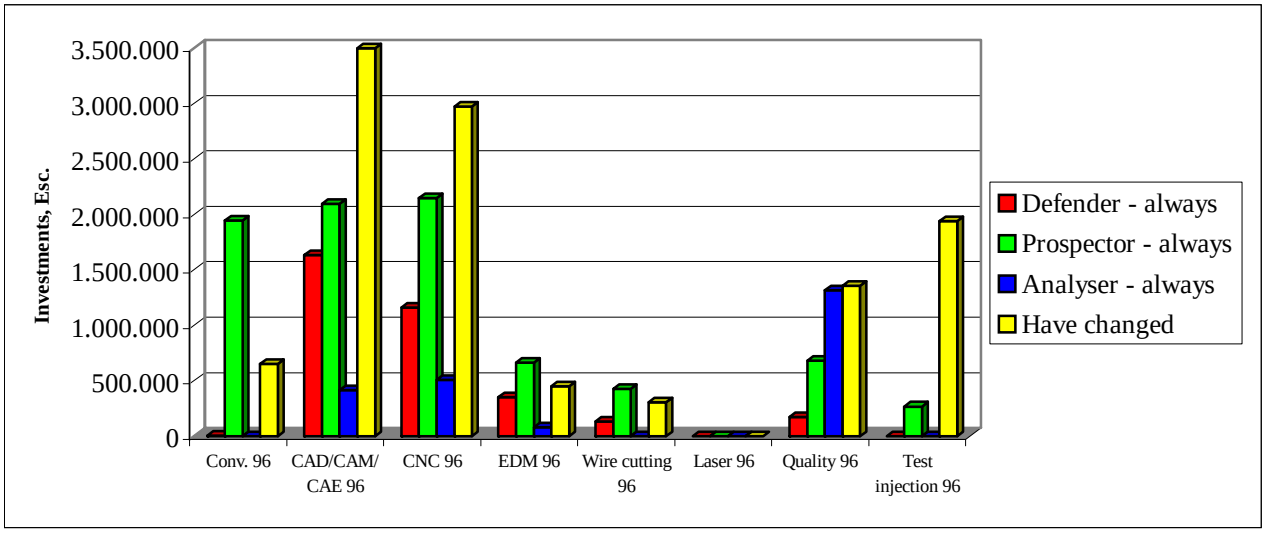


Figure 79 - Differences between patterns of *Stayers* and *Movers* for each strategy type, and technological investments, 1980-96

Figure 79A - Patterns of *Stayers* and *Movers*, and the technology in which firms invested, 1980-86

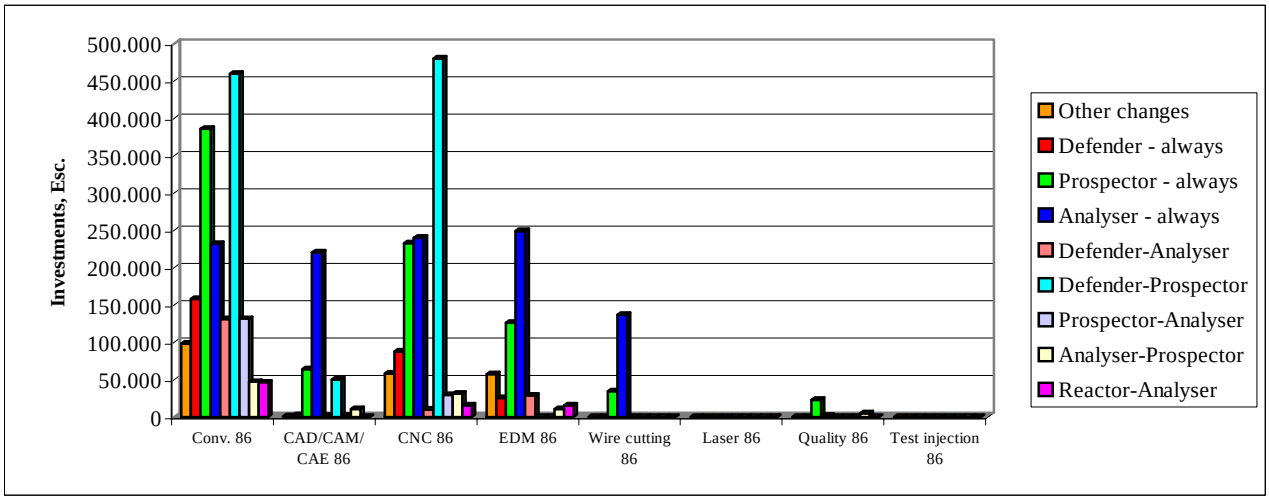


Figure 79B - Patterns of *Stayers* and *Movers*, and the technology in which firms invested, 1987-92

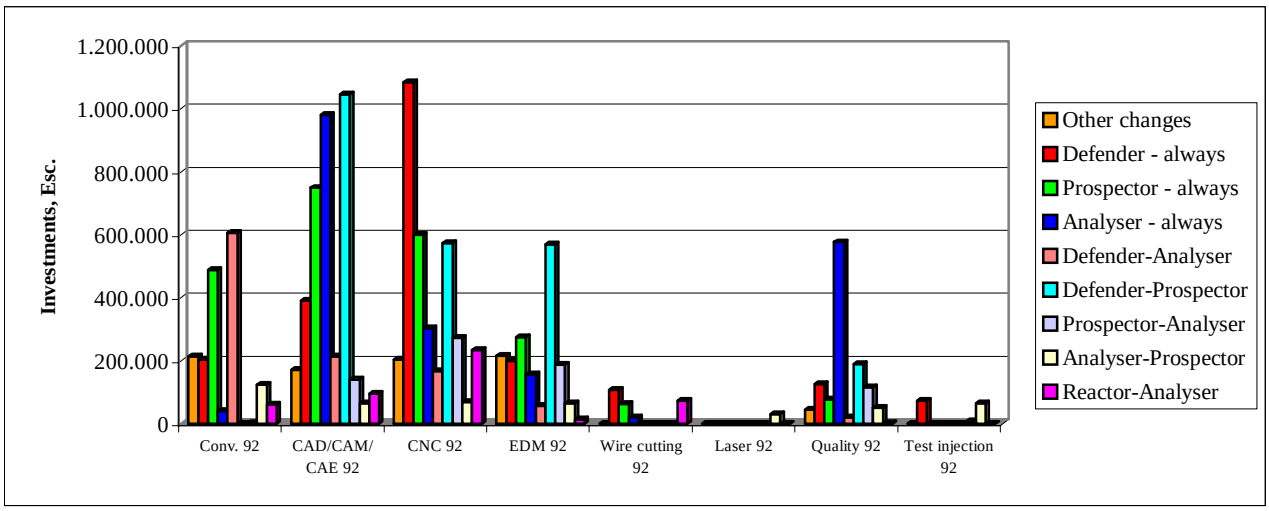


Figure 79C - Patterns of *Stayers* and *Movers* and, and the technology in which firms invested, 1993-95

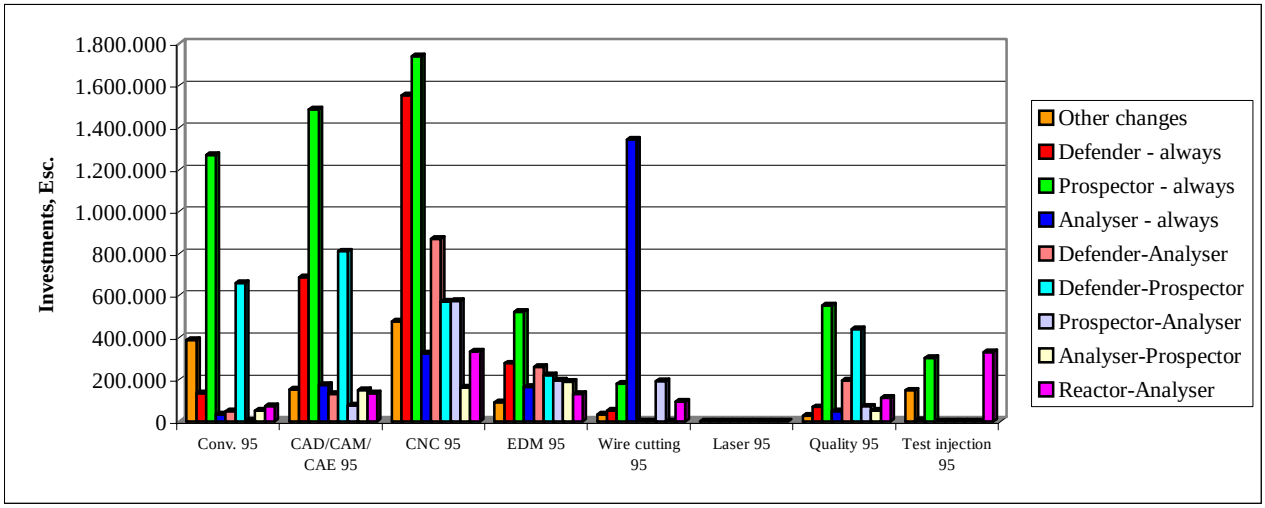
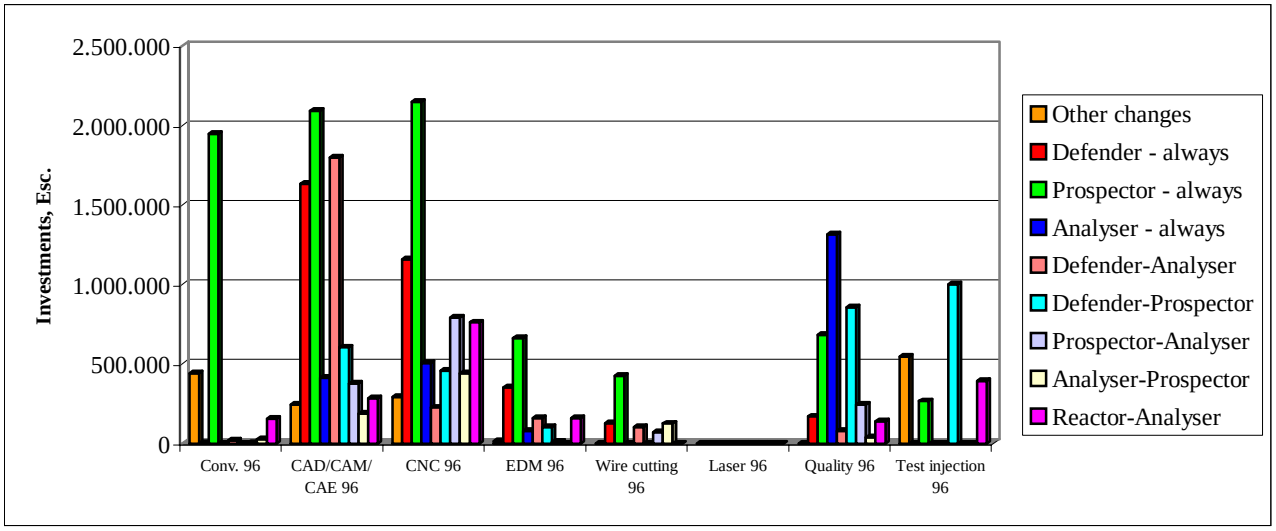


Figure 79 Cont. - Differences between patterns of *Stayers* and *Movers* for each strategy type, and technological investments, 1980-96

Figure 79D - Patterns of *Stayers* and *Movers*, and the technology in which firms invested, 1996



Are there differences between Stayers and Movers and the benefits offered to customers and the subcontracting policy? The results reveal that *Movers* offer lower benefits to customers than *Stayers* (see Figure 80). It is suggested that as *Movers* change their strategic behaviour, they may focus their resources in several directions. Change generates uncertainty and instability, which may reflect negatively on the benefits offered to customers. When the patterns of *Stayers* and *Movers* for each strategy type are analysed, on average *Stayer* Prospectors, Defenders-Prospectors and Analysers-Prospectors offered more benefits to their customers (see Figure 81). *Stayer* Prospectors score significantly higher on innovation, post-sales support, a varied range of services and quality, and these dimensions have been consistently emphasised over the timescales. Thus, it seems that as the business strategy is defined, convergent changes are reinforcing it. Defenders-Prospectors offered shorter delivery times, and more competitive prices, and Analysers-Prospectors doing something different and unique. The findings suggest that when firms change their strategic behaviour they undergo the process of uncertainty that may affect the robustness and efficacy of their strategy. In summary, the findings show that *Stayer* Prospectors and firms that moved their strategy to Prospectors offer more benefits to their customers. Thus, the Prospector strategic behaviour should be pursued by other firms. This outcome is significantly pertinent for

policy makers, as if they want to spread the good image of the Portuguese mould industry, they should do so with *Stayer* Prospector firms or *Movers* that have changed their strategy to Prospectors. Also, the policies developed to increase firms' competitiveness should be based on, and adapted from, Prospectors strategic behaviour. It is also interesting to note that Reactors-Analysers also offered satisfactory levels of benefits to their customers. This finding is academically important, because it shows that Reactors are able to change to another strategy type and find consistency in their strategic orientation.

Over the timescales, in aggregate (with the exception of mould design and the CAD/CAM/CAE systems) *Stayers* subcontract more than *Movers* (see Figure 82). The findings also reveal *that Stayers* have been following the same strategic pattern: *Stayer* Prospectors have been always led in the subcontracting of complete moulds, *Stayer* Defenders in, parts of the manufactured mould, and *Stayer* Analysers in mould testing. It therefore, seems that once the *Stayers*' business strategy is defined, they only make minor adjustments to reinforce their position as the environment changes. *Stayers* may have established a subcontracting business network relationships in the sector. Nonetheless, when the patterns of *Stayers* and *Movers* for each strategy types are analysed: Defenders-Prospectors subcontract more parts of the mould than any other strategy type, Analysers-Prospectors, more assembling, Prospectors-Analysers more mould base, and Reactors-Analysers more mould testing (see Figure 83). It is suggested that *Movers*, in order to become more flexible, opt for subcontracting services or tasks of the manufactured mould. It is interesting to note that while firms that moved from Defenders to Prospectors maintained the subcontracting strategic behaviour of *Stayer* Defenders (the subcontracting of parts of the mould), firms that moved from Reactors to Analysers followed the subcontracting strategic orientation of *Stayer* Analysers (the mould testing). Reactors do not have a consistent strategic orientation, so they follow the strategic behaviour of the strategy type that they moved to.

These findings also show that while *Stayers* maintain a relatively stable pattern of their subcontracting value, the *Movers* often vary over the periods. This may reflect again the uncertainty associated with the change of strategy.

Figure 80 - Means, differences between *Stayer* and *Mover* strategic groups and the firms' benefits offered to customers, 1980-97

Figure 80A - *Stayers* and *Movers* and the firms' benefits offered to customers, 1980-86

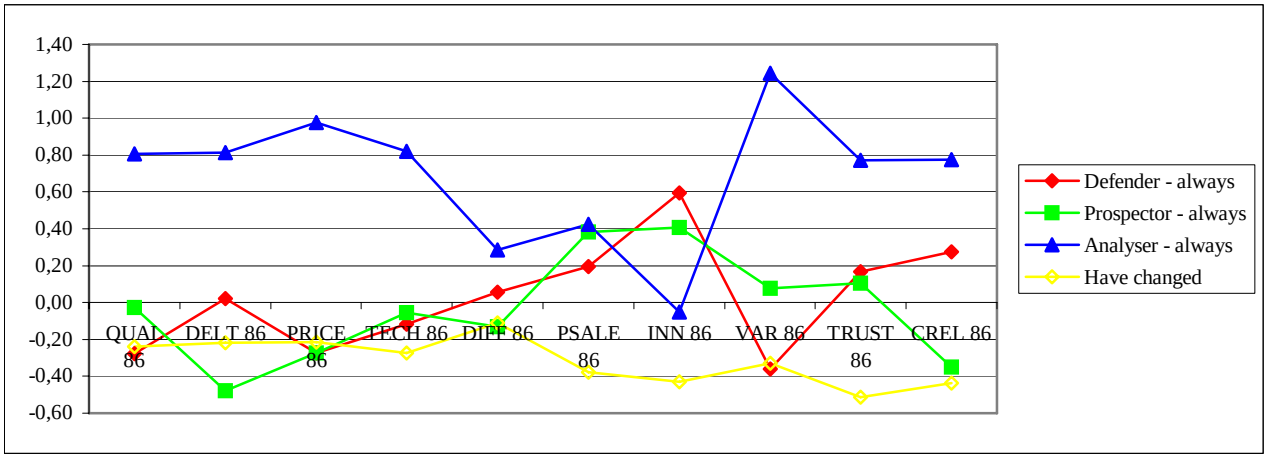


Figure 80B - *Stayers* and *Movers* and the firms' benefits offered to customers, 1987-92

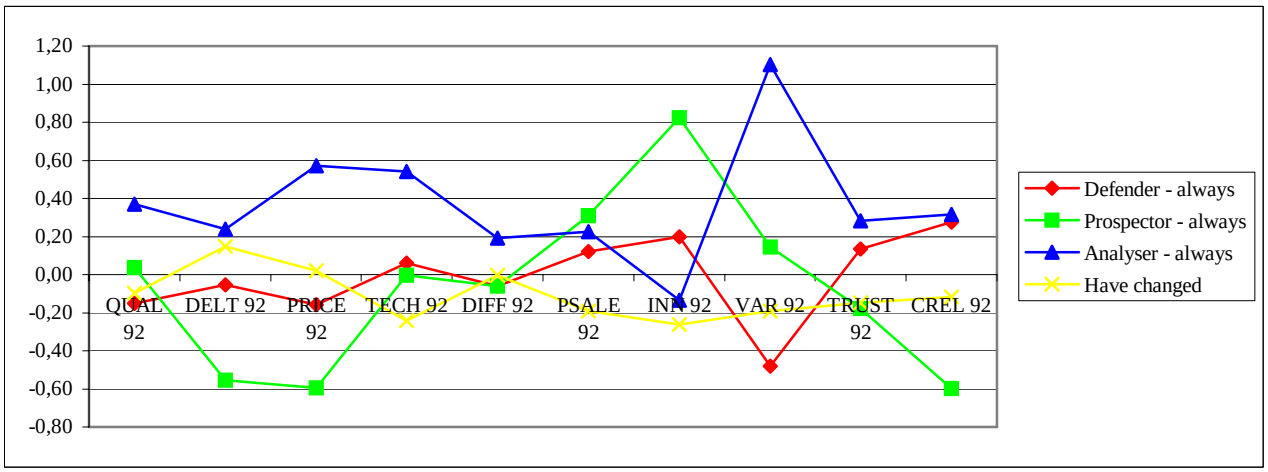


Figure 80C - *Stayers* and *Movers* and the firms' benefits offered to customers, 1993-95

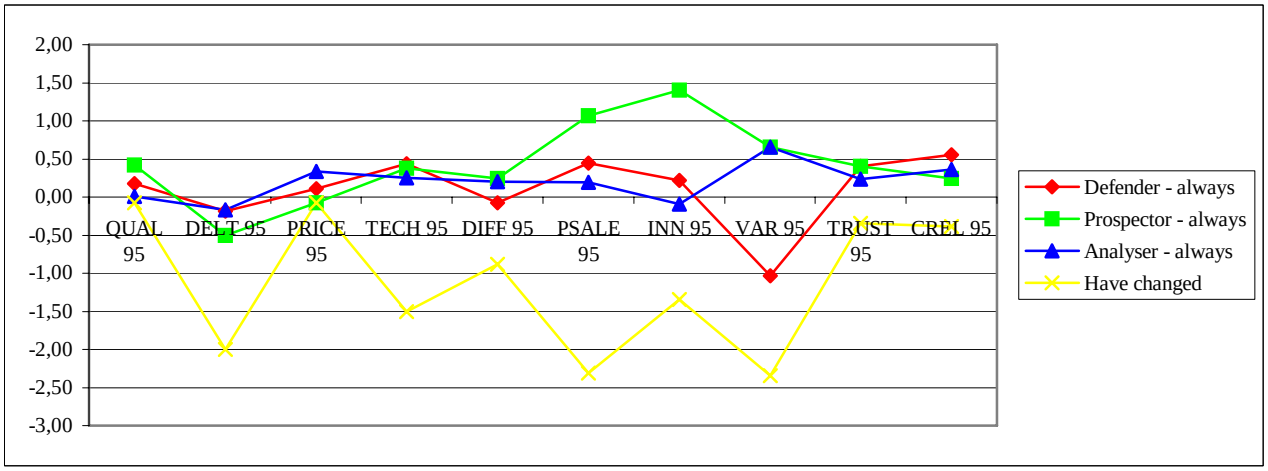


Figure 80 Cont. - Means, differences between *Stayer* and *Mover* strategic groups and the firms' benefits offered to customers, 1980-97

Figure 80D - *Stayers* and *Movers* and the firms' benefits offered to customers, 1996

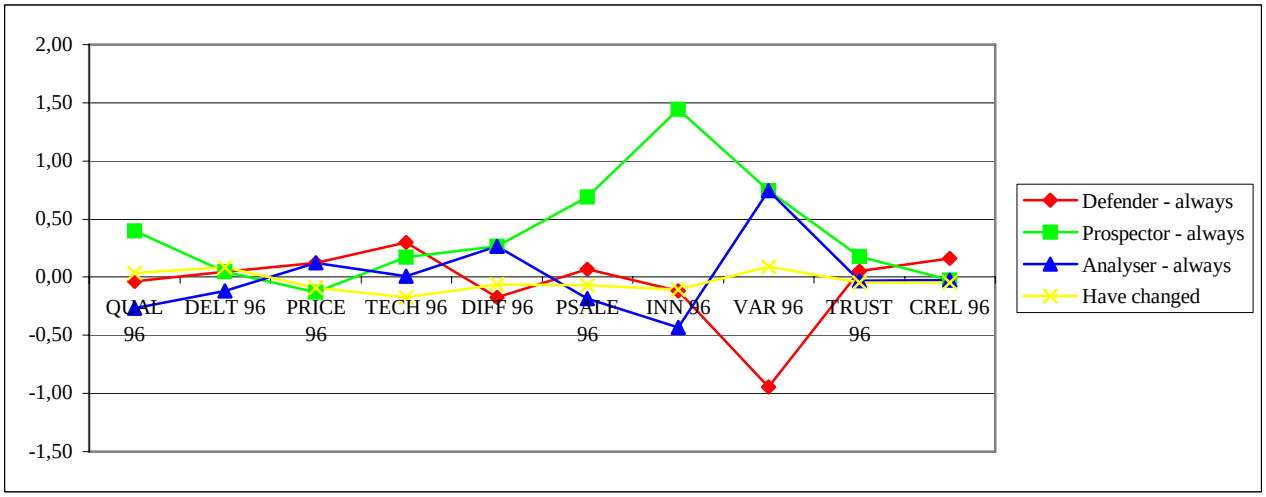


Figure 80E - *Stayers* and *Movers* and the firms' benefits offered to customers, 1997

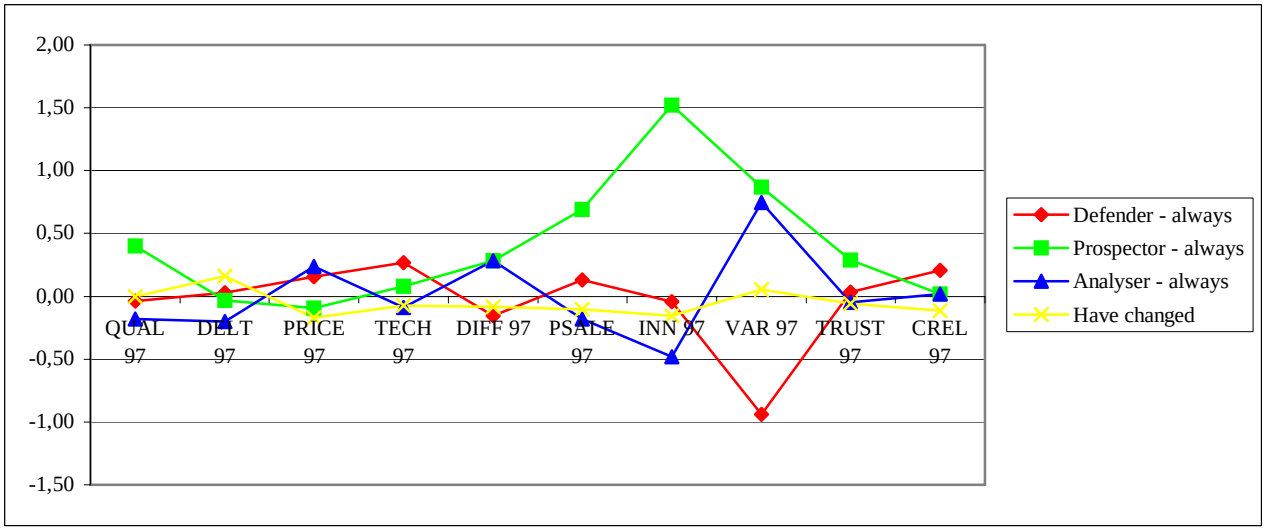


Figure 81 - Means, differences between patterns of *Stayers* and *Movers* for each strategy type, and the benefits offered to customers, 1980-97

Figure 81A - Patterns of *Stayers* and *Movers* and the firms' benefits offered to customers, 1980-86

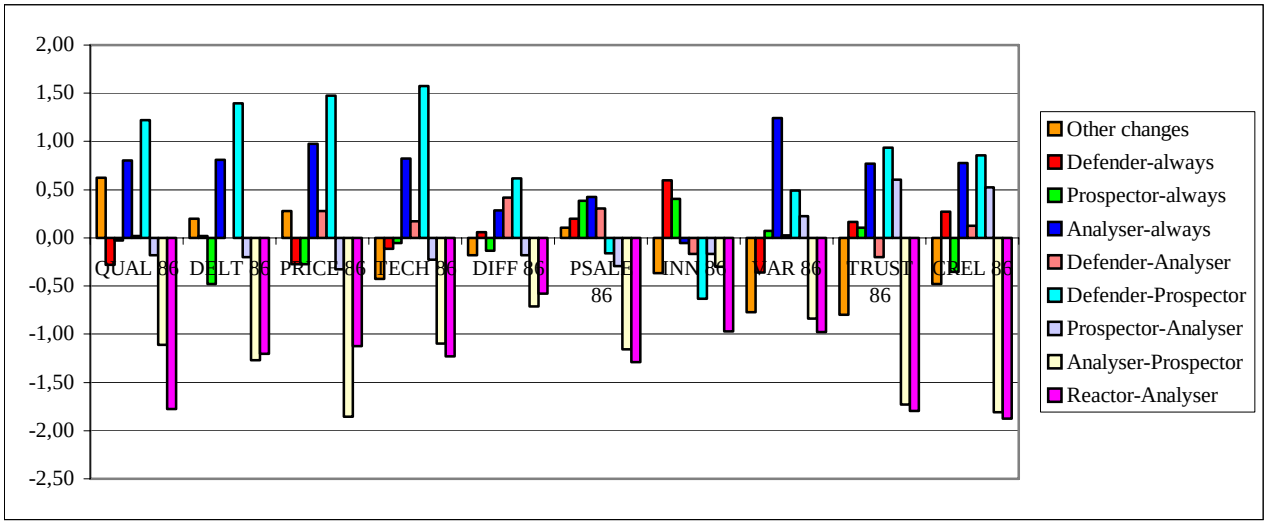


Figure 81B - Patterns of *Stayers* and *Movers* and the firms' benefits offered to customers, 1987-92

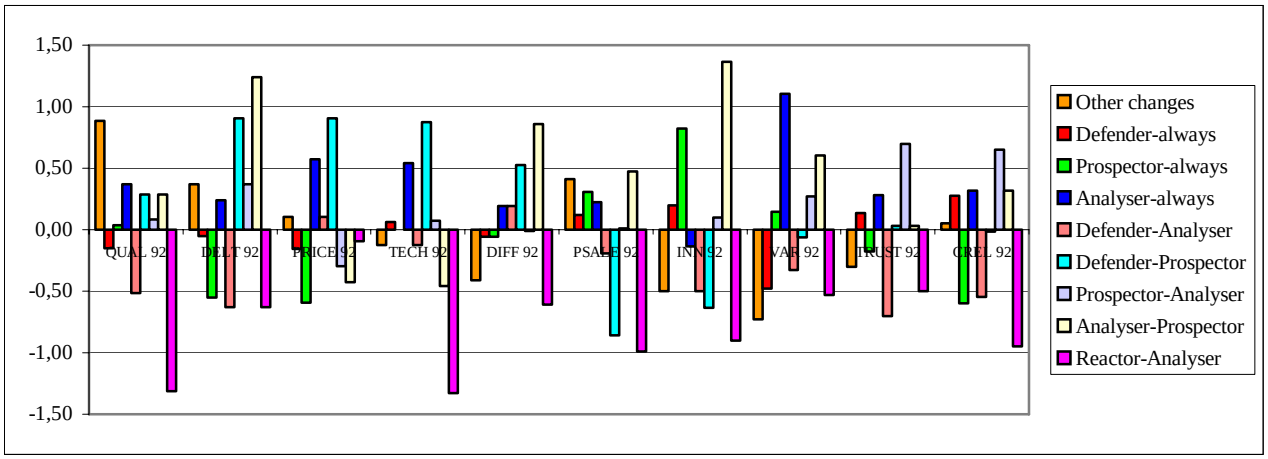


Figure 81C - Patterns of *Stayers* and *Movers* and the firms' benefits offered to customers, 1993-95

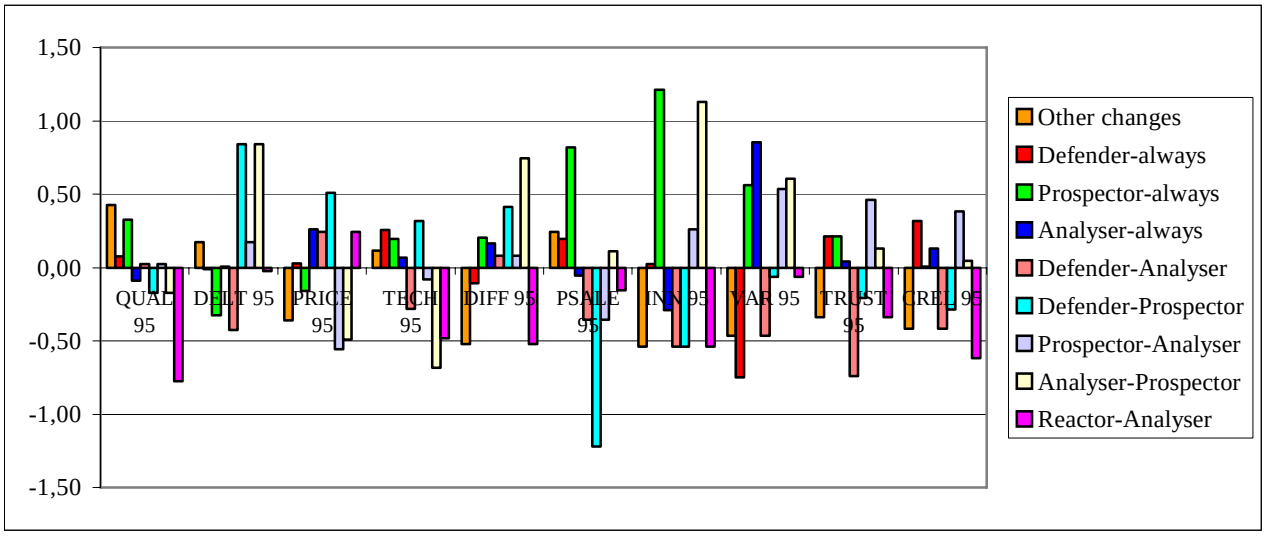


Figure 81 Cont. - Means, differences between patterns of *Stayers* and *Movers* for each strategy type, and the benefits offered to customers, 1980-97

Figure 81D - Patterns of *Stayers* and *Movers* and the firms' benefits offered to customers, 1996

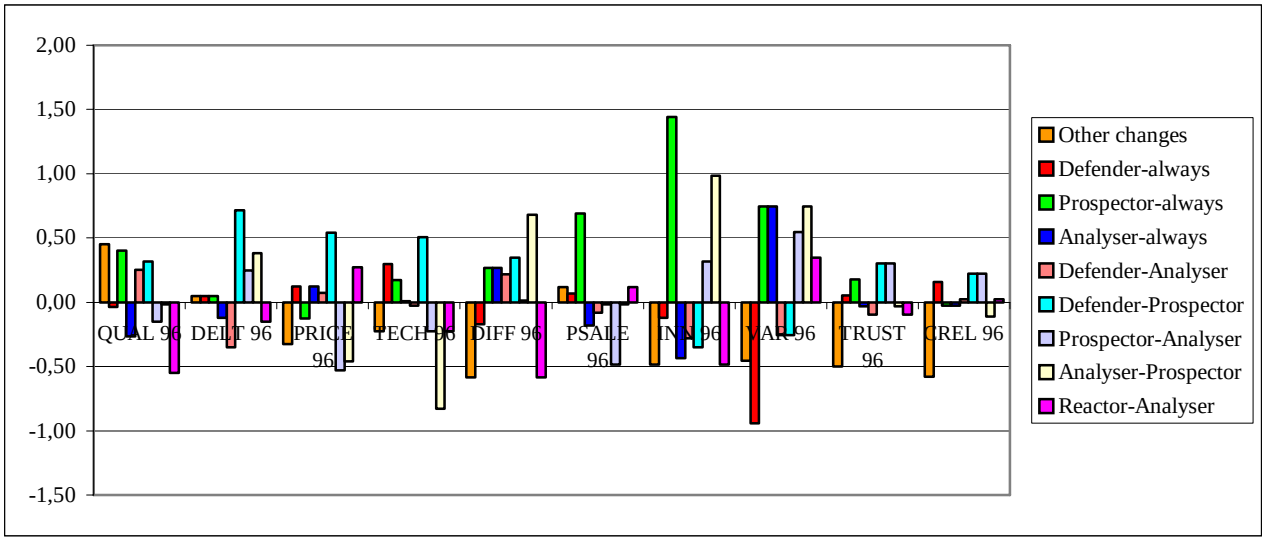


Figure 81E - Patterns of *Stayers* and *Movers* and the firms' benefits offered to customers, 1997

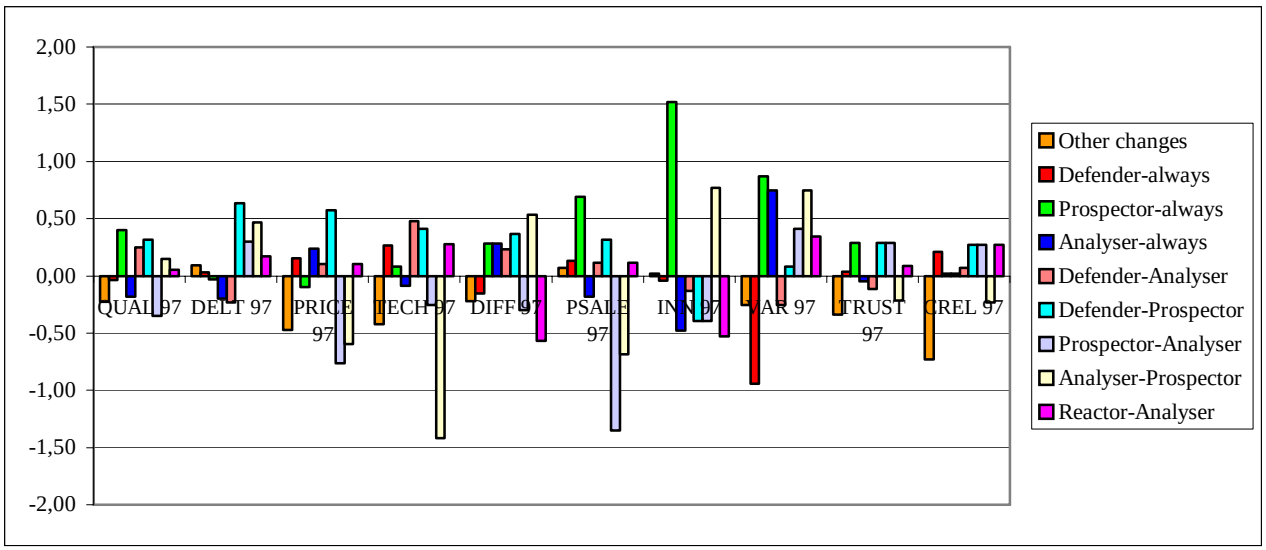


Figure 82 - Means, differences between *Stayer* and *Mover* strategic groups and what firms subcontract, 1980-97

Figure 82A - *Stayers* and *Movers* and what firms subcontract, 1980-86

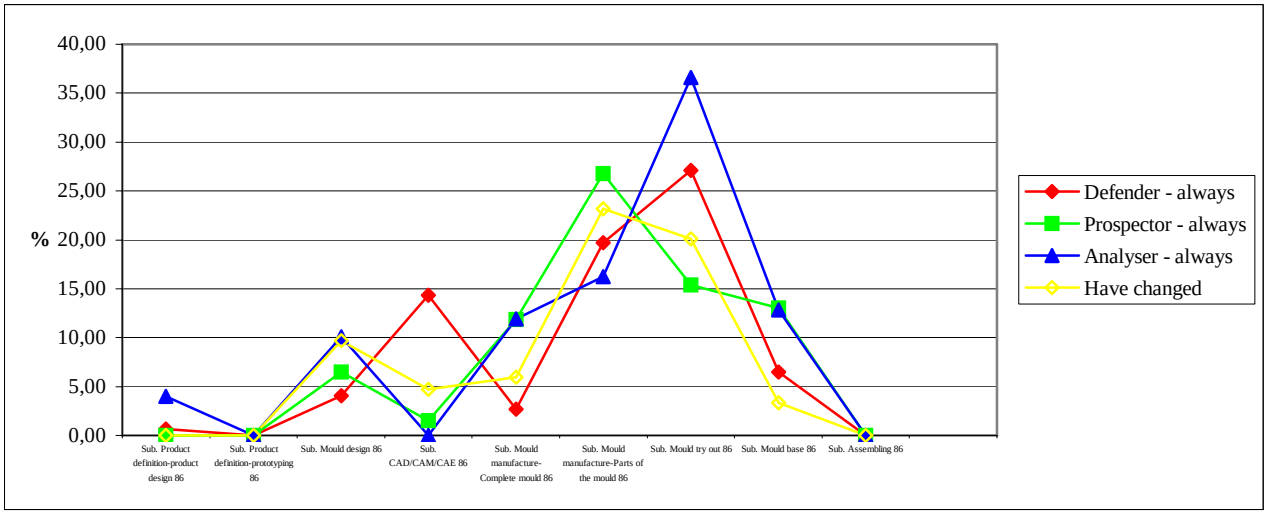


Figure 82B - *Stayers* and *Movers* and what firms subcontract, 1987-92

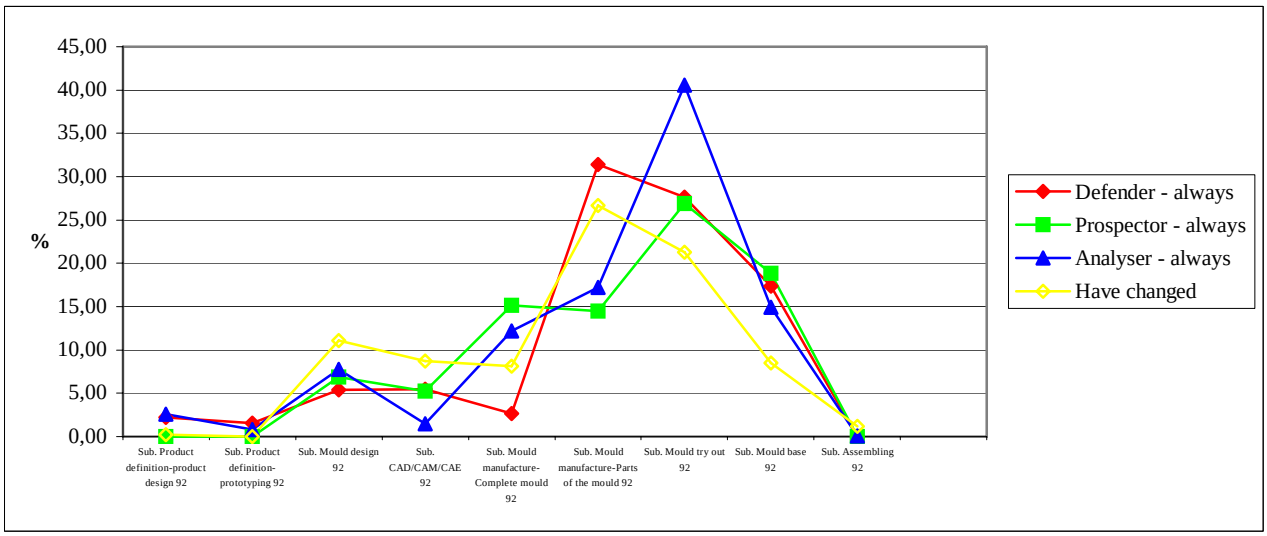


Figure 82C - *Stayers* and *Movers* and what firms subcontract, 1993-95

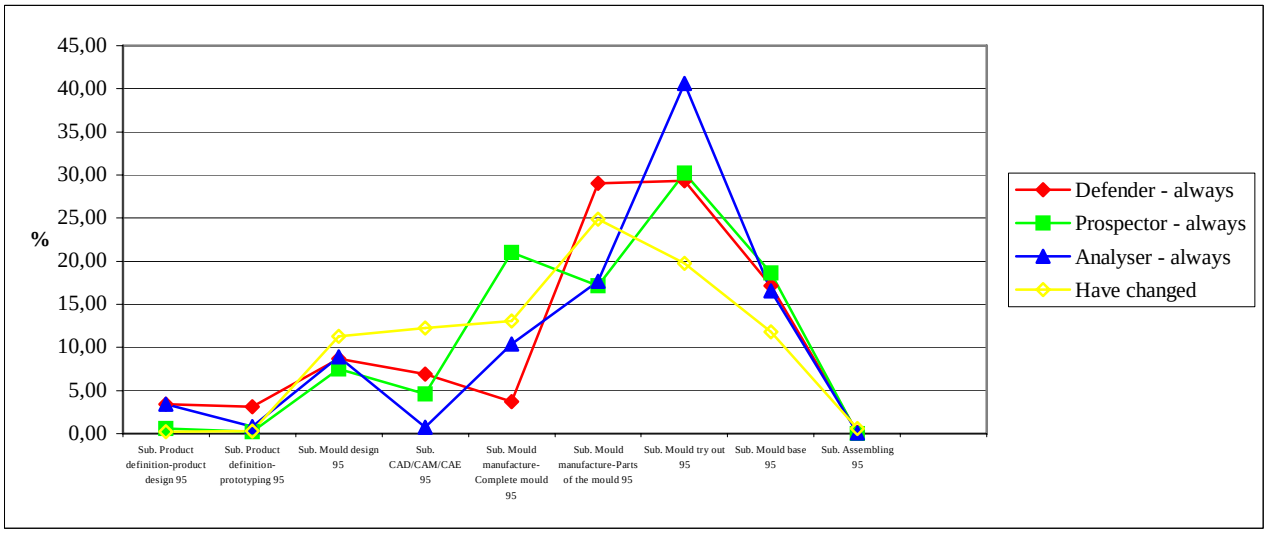


Figure 82Cont. - Means, differences between *Stayer* and *Mover* strategic groups and what firms subcontract, 1980-97

Figure 82D - *Stayers* and *Movers* and what firms subcontract, 1996

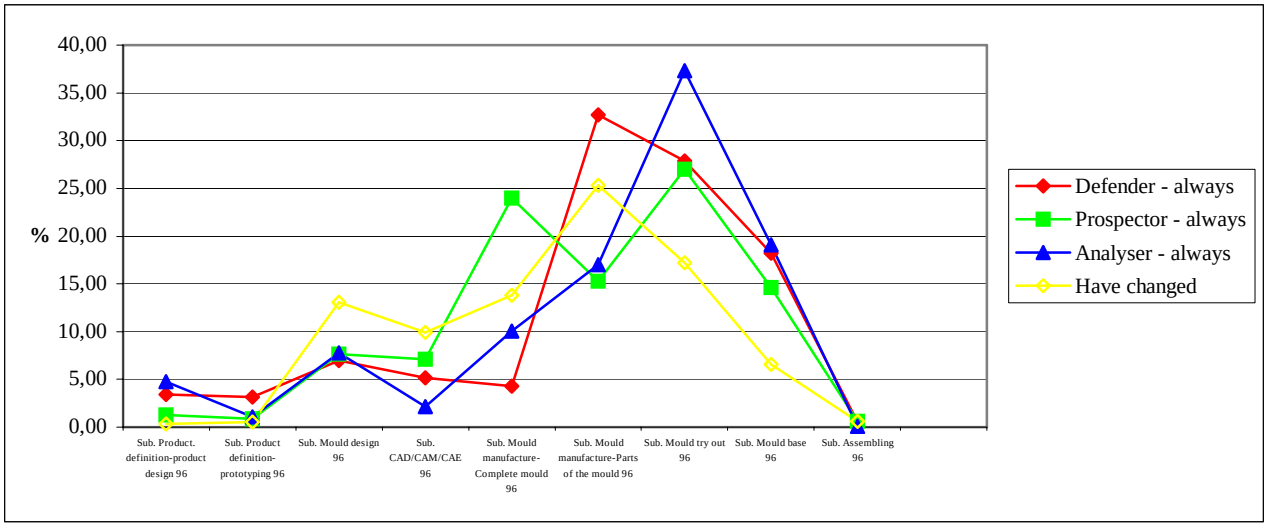


Figure 82E - *Stayers* and *Movers* and what firms subcontract, 1997

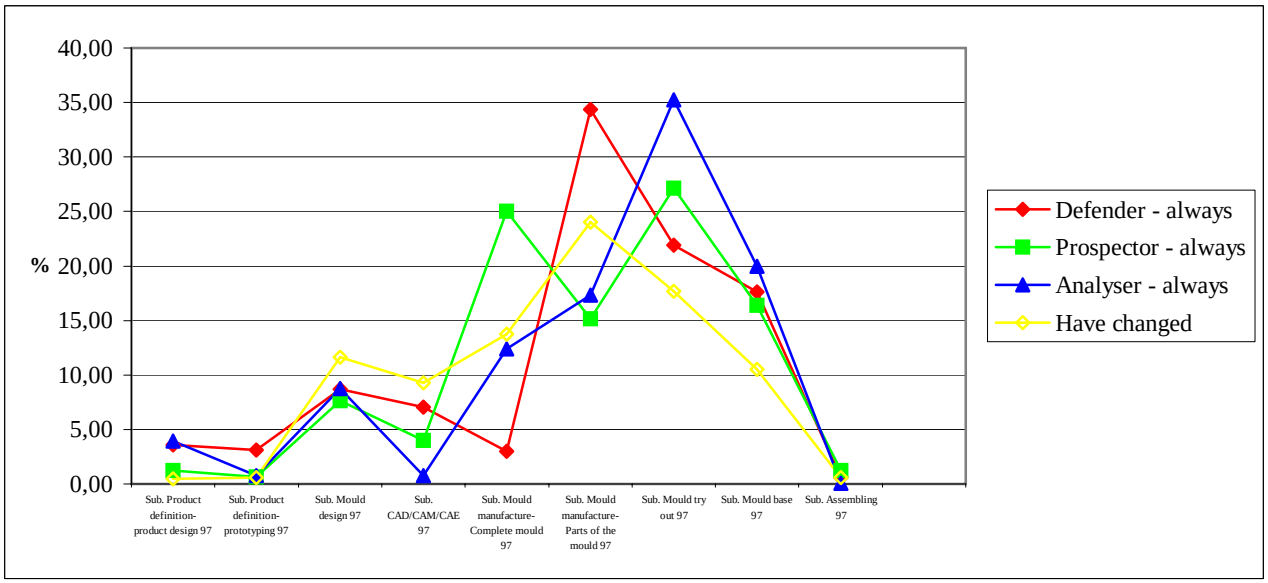


Figure 83 - Means, differences between patterns of *Stayers* and *Movers* for each strategy type, and what firms subcontract, 1980-97

Figure 83A - Patterns of *Stayers* and *Movers* and what firms subcontract, 1980-86

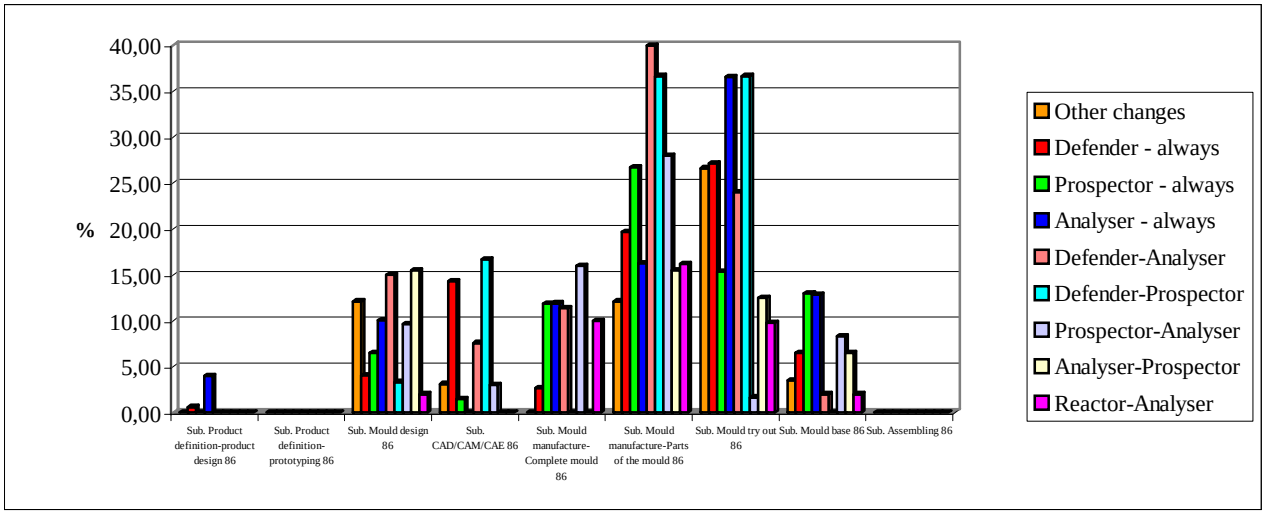


Figure 83B - Patterns of *Stayers* and *Movers* and what firms subcontract, 1987-92

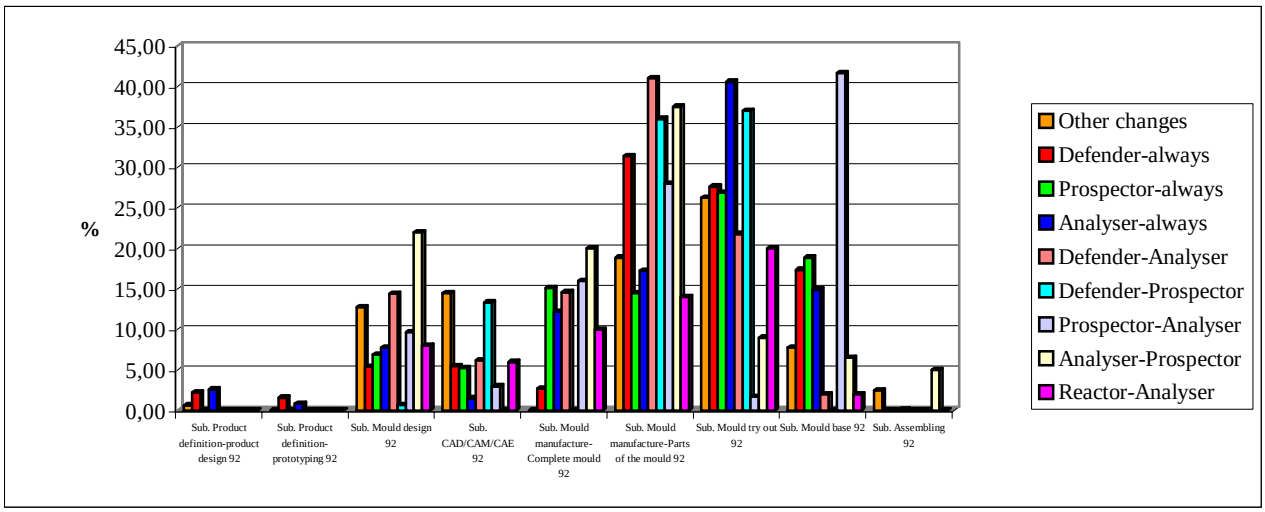


Figure 83C - Patterns of *Stayers* and *Movers* and what firms subcontract, 1993-95

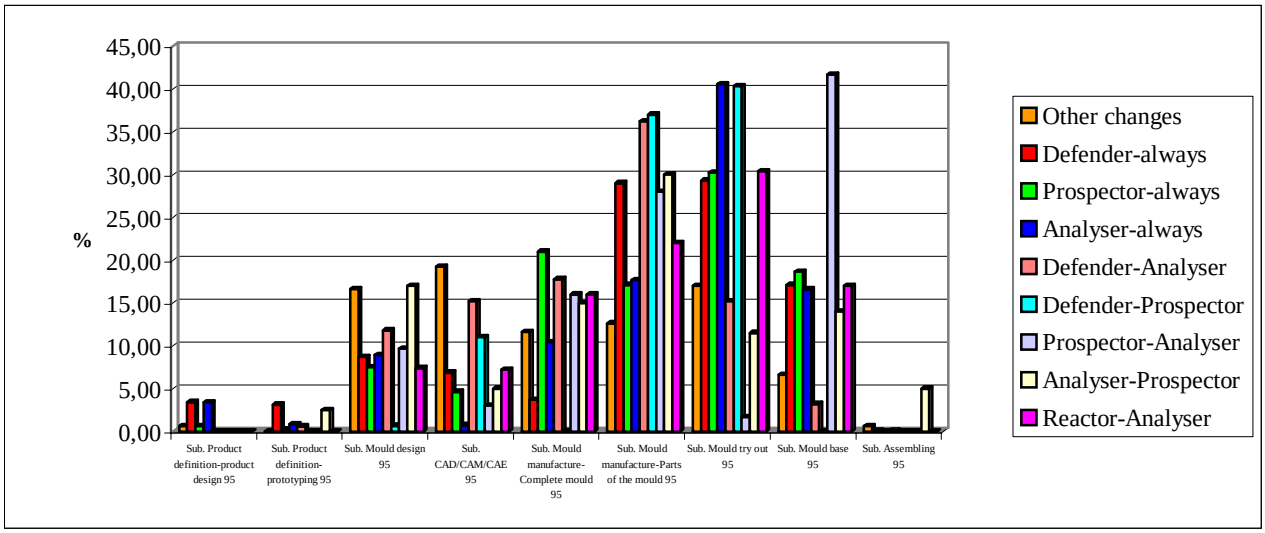


Figure 83 Cont. - Means, differences between patterns of *Stayers* and *Movers* for each strategy type, and what firms subcontract, 1980-97

Figure 83D - Patterns of *Stayers* and *Movers* and what firms subcontract, 1996

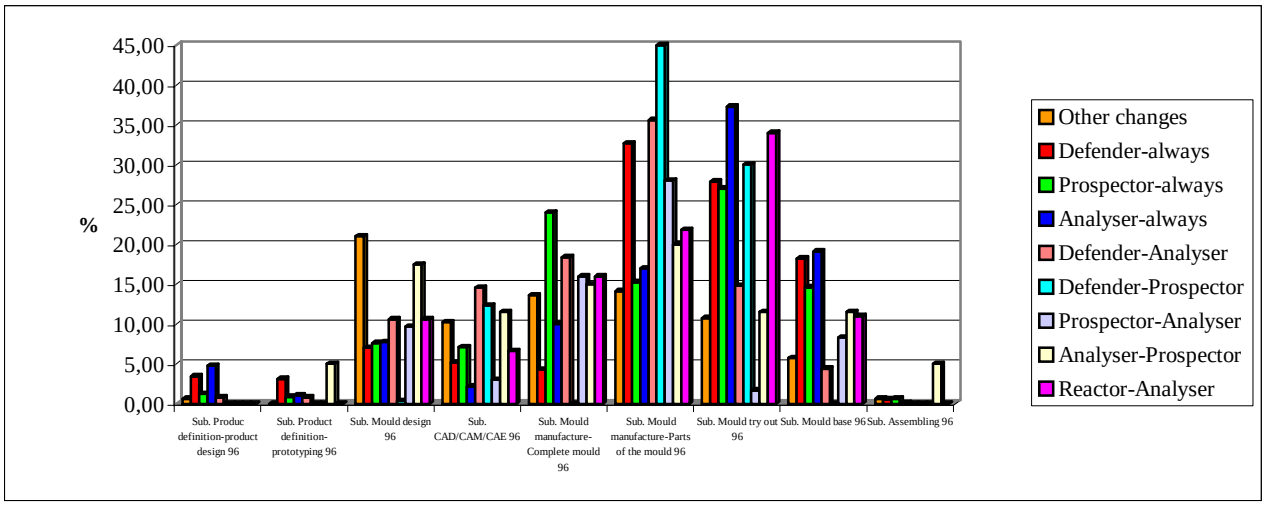
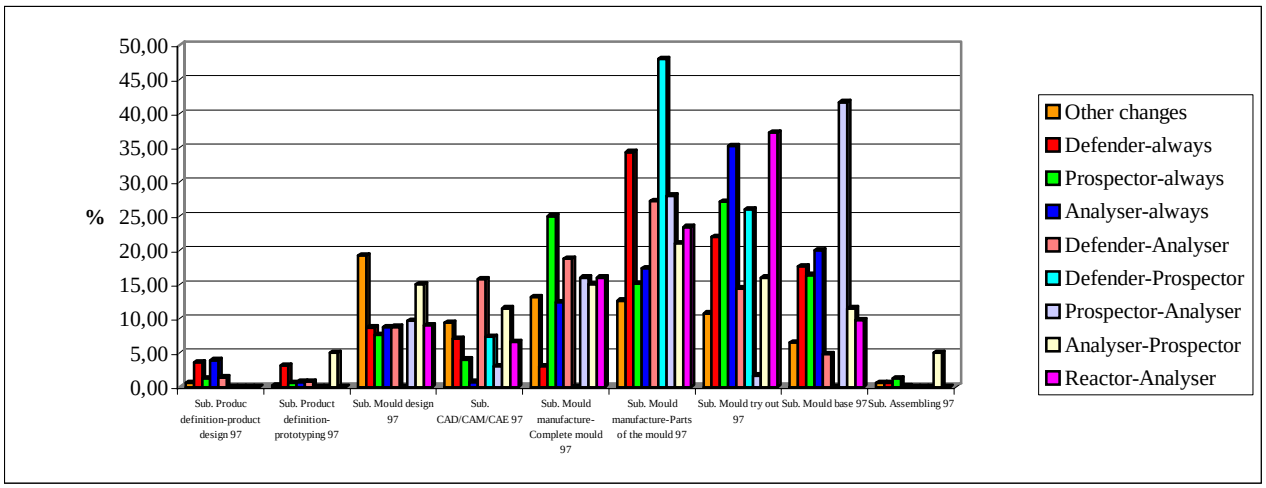


Figure 83E - Patterns of *Stayers* and *Movers* and what firms subcontract, 1997



Further details (Tables) about the dynamics of Miles and Snow's strategy types can be seen in appendix 5O.

In summary, the H3.6. hypothesis was confirmed: *Movers have different business profiles from Stayers.* The findings have significant theoretical and managerial implications. Zajac and Shortell (1989) explored from to which firms moved their strategy. However, they surprisingly neglected the analysis of the differences in strategic behaviour between firms that changed and those that maintain their strategic stance over time. This research has enhanced further contribution to the knowledge.

The findings reveal as expected that *Stayers* tend to maintain their strategic behaviour over time, and *Movers* tend to change it. *Stayers* adapt to the changing environment by making minor adjustments; convergent changes, while *Movers* undertake major changes. *Stayers* define their strategic position very early, and they reinforce it over time. It seems that somehow they were able to anticipate their business strategy to the changing environment, and they managed by large to "get it right"(especially *Stayers* Prospectors). As suggested by Oster (1982), Miles and Cameron (1982) and Miller and Friesen (1984) firms continue with their existing strategy and they develop internal consistencies for further extend it. *Movers* change their strategic stance quite often, reflecting the inherent uncertainty of their choice. Their values often vary significantly from one period to another, and that may have a negative influence on their business strategy effectiveness. Moreover, the analysis reveals that when patterns of *Stayers* and *Movers* for each strategy type are analysed, Prospectors (whether *Stayer* Prospectors or Defenders who became Prospectors) account for the highest values on sectoral markets, client industries, investments, technological investments, and benefits offered. It appears therefore, that Prospectors confer any kind of competitive advantage. Thus, they should be the strategic behaviour to be pursued by other strategy types.

After having analysed the dynamics of Miles and Snow's (1978) strategy types, the next aim of the research is to explore the relationships between the dynamics of strategy and organisational performance. The following section explores and analyses the issue in detail.

6.4. Exploring the relationship between the dynamics of Miles and Snow's strategy types and organisational performance

The aim of this section is to analyse the relationships between the dynamics of Miles and Snow's strategy types and organisational performance. It explores several things: a) the impact of environmental changes on business strategy and organisational performance; b) whether firms perform equally well across different environmental settings; c) if there are significant differences in performance in strategy types; d) whether *Mover* firms outperform *Stayers*; and, e) whether firms that changed to one specific strategy type outperform those that changed to another specific strategy type.

Zajac and Shortell (1989) analysed the relationships between the dynamics of strategy and business performance. They explored whether firms that changed strategies were less profitable, in terms of profit margin ratio, than those that did not. They found that different levels of performance were exhibited across strategy types but no significant differences in profitability were found between organisations that changed strategies versus those that did not. Their findings revealed that simply changing strategy does not necessarily imply performance advantages. Organisations that change strategy may or may not perform those that do not. Zajac and Shortell (1989) also investigated whether firms that changed to Defenders were less profitable (in terms of profit margin ratio) than firms that changed to Analysers and Prospectors. Their results showed that there were no significant performance differences between firms that changed to one specific strategy type and those that changed to another strategy type: thus, they found that hospitals that changed to Defenders were neither more nor less profitable than hospitals that changed to other generic strategies and that organisations that changed to Defenders may or may not outperformed those that changed to Analysers or Prospectors. Since, in the current research, there is only one firm that has moved to Defenders, and, as we have already seen, Defenders are poor performers in dynamic environments, the research explores whether firms that changed to Analysers outperform those firms that changed to Prospectors.

Based on Zajac and Shortell's (1989) research it is expected there will be no significant performance differences between *Movers* and *Stayers*. Additionally, no significant performance differences between firms that changed to one specific strategy type and those that changed to another strategy type are expected. Thus, the following hypotheses were tested:

H4. Overall, Movers do not outperform Stayers.

H4.1. Firms that changed to one specific strategy type may or may not outperform those that changed to another strategy type: firms that changed to Analysers may or may not outperform those firms that changed to Prospectors.

To emphasise the differences between strategy types, the mean was calculated for each item, and then subtracted from the total mean and divided by the standard deviation. The analysis shows that in stable environments there is no consistent pattern between *Stayer* and *Mover* strategic groups and organisational performance. Different strategy types outperformed others in different performance measures. However, in dynamic environments *Stayer* Prospectors outperformed other strategy types.

In 1980-86, *Stayer* Defenders outperformed the other strategy types on return on sales and sales growth, *Stayer* Analysers on return on equity, *Stayer* Prospectors on sales/moulds and *Movers* on return on assets (Figure 84). In the early 80s, the industry was booming, Defenders were opening up plants and the environment favoured their growth. As small firms any increase in their sales had a huge impact on their sales ratios (when there is a sales increase, the impact on the sales growth rate is higher in small than in large firms).

In 1987-92, *Movers* outperformed the other strategy types on return on sales and on sales growth. *Stayer* Prospectors outperformed on sales/moulds. In the following periods, in 1993-95 and 1996, with the exception of return on sales, *Stayer* Prospectors distinctively outperformed the other strategy types. In a discussion with a Defender organisation it emerged that while Defenders manufacture moulds (of small to medium capacity and of medium to high complexity) that may cost €69,832, e.g. a mould for a car radio connector, Prospectors manufacture moulds, (of large to very large capacity and of medium to high complexity) e.g. a vacuum clear, that cost twice as much as the mould for a car radio connector. Small firms therefore need to produce twice as much as Prospectors in order to have the same turnover. It is also important to note that *Stayer* Prospectors always outperformed the other strategy types on sales/moulds. They also outperformed on asset intensity, sales per employee and profit per employee, showing that it is the production of large to very large capacity moulds, of medium to high complexity that can bring about added value and organisational productivity.

The findings have significant managerial and theoretical implications. First, because they show that, although there are only eight *Stayer* Prospector firms, they significantly outperformed all the other strategy types in dynamic environments; governmental and

sectoral institutions should therefore encourage Defenders and Analysers to follow their strategic behaviour. Second, because they illustrate that *Movers* were mainly those firms that most changed the capacity or complexity of the manufactured mould that changed the markets to which they were selling, or that invested the most. However, these efforts were not translated into better levels of organisational performance; the changes did not reflect an impact on increased organisational performance: in dynamic environments *Stayer* Prospectors outperformed *Movers*. The current research found support for Zajac and Shortell's (1989) results: organisations that changed strategies did not outperform those that maintained them. Therefore, changing strategies is not a good predictor of performance differences. As a result, H4. was rejected: *Movers* outperformed in some organisational performance measures *Stayers* in stable environments, but in dynamic environments *Stayer* Prospectors outperformed other strategy types.

Additionally, when patterns of *Stayers* and *Movers* for each strategy type are analysed, the analysis reveals that in stable environments there is still no consistent pattern, but in dynamic environments *Stayer* Prospectors or firms that moved from Defenders to Prospectors overall outperformed other strategy types (see Figure 85). In 1980-86, in stable environments, *Stayer* Defenders outperformed on return on sales and sales growth, *Movers*: Reactors who became Analysers significantly outperformed the other strategic types on profit margin, return on equity, and return on assets, and Defenders-Prospectors on sales/moulds. In 1987-92, Reactors-Analysers still outperformed the other strategic types on profit margin, return on equity and return on assets, but differences were less significant. "Other changes" outperformed the other strategic types on return on sales and sales growth, and *Stayer* Prospectors outperformed on sales/moulds.

In 1993-95, in dynamic environments, *Stayer* Prospectors outperformed the other strategy types on return on equity and return on assets, but not on sales/moulds, it was the Defenders-Prospectors. In 1996, *Stayer* Prospectors outperformed other strategic groups on profit margin and on return on assets, Defenders-Prospectors on return on sales and sales/moulds, Defenders-Analysers on return on equity and Prospectors-Analysers on asset intensity. So, in stable environments, different strategy types outperform others in different performance measures: there was no consistent pattern.

However, in dynamic environments, Prospectors (both *Stayer* Prospectors and Defenders-Prospectors) had overall higher levels of organisational performance. It therefore seems that the Prospector strategy type is the one to be followed (for further details about the differences between *Movers* and *Stayers*, please see appendix 5P).

Additionally, the results demonstrated that there were no significant performance differences between firms that changed to one specific strategy type and those that changed to another strategy type (see Figure 85). Different strategy types outperformed other in different performance measures, i.e. firms that changed to Analysers outperformed other strategy type on return on equity (Defenders-Analysers) and on asset intensity (Prospectors-Analysers) and firms that changed to Prospectors (Defenders-Prospectors) outperformed other strategy types on return on sales and sales/moulds. The current research found support for Zajac and Shortell's (1989) results. The H4.1. hypothesis was confirmed, *firms that changed to Prospectors may or may not outperform those that changed to Analysers or vice versa*.

It is interesting to note that firms that moved from Reactors to Analysers and from Defenders to Prospectors (skipping intermediate stages) completely changed their strategic orientation. In discussion with their managers, it transpired that both changed their mould production segmentation: they specialised their mould production in large to very large moulds, invested significantly in technology and became more marketing orientated. The Defender-Prospector firms concentrated their production on moulds of large dimensions e.g. for gardening furniture (chairs, tables, etc). This specialisation enabled them to gain a knowledge-learning competitive advantage, with an impact on cost reduction and shortening delivery times (they have an important learning curve in manufacturing for this sectoral market). The Reactor-Analyser firms specialised their mould production for the automotive industry. In discussion with a Reactor-Analyser, a top manager said that the company was in very serious financial difficulties (justifying the Reactor position) and it was its acquisition by a French firm that enabled them to renew their technological equipment (essential in the manager's viewpoint to achieve competitiveness).

Figure 84 - Means, differences between *Stayer and Mover* strategic groups and organisational performance ratios, 1980-96

Figure 84A - *Stayers* and *Movers*, and organisational performance ratios, 1980-86

Figure 84B - *Stayers* and *Movers*, and organisational performance ratios, 1987-92

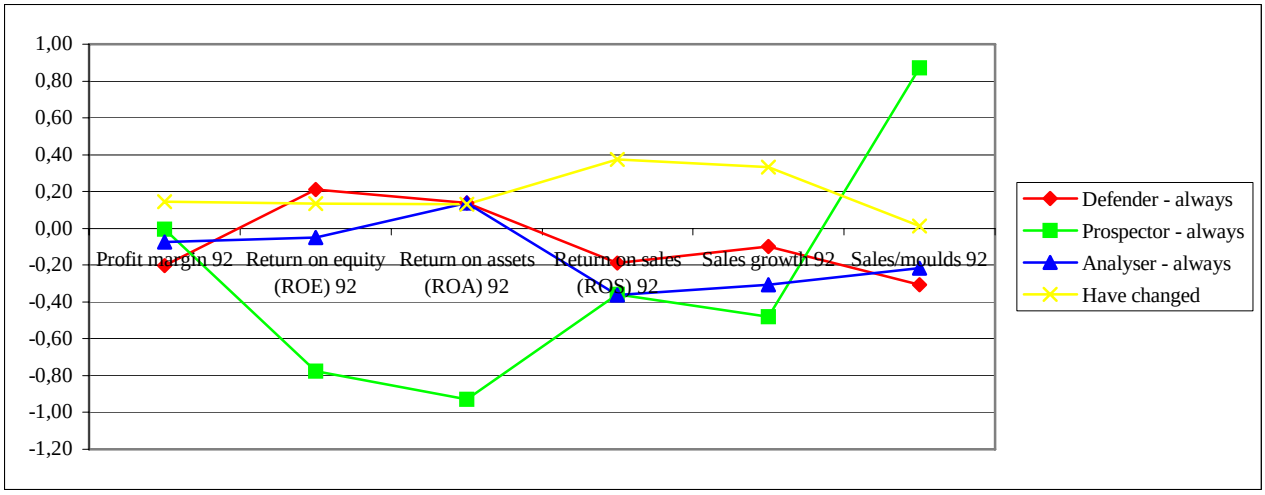


Figure 84C - *Stayers* and *Movers*, and organisational performance ratios, 1993-95

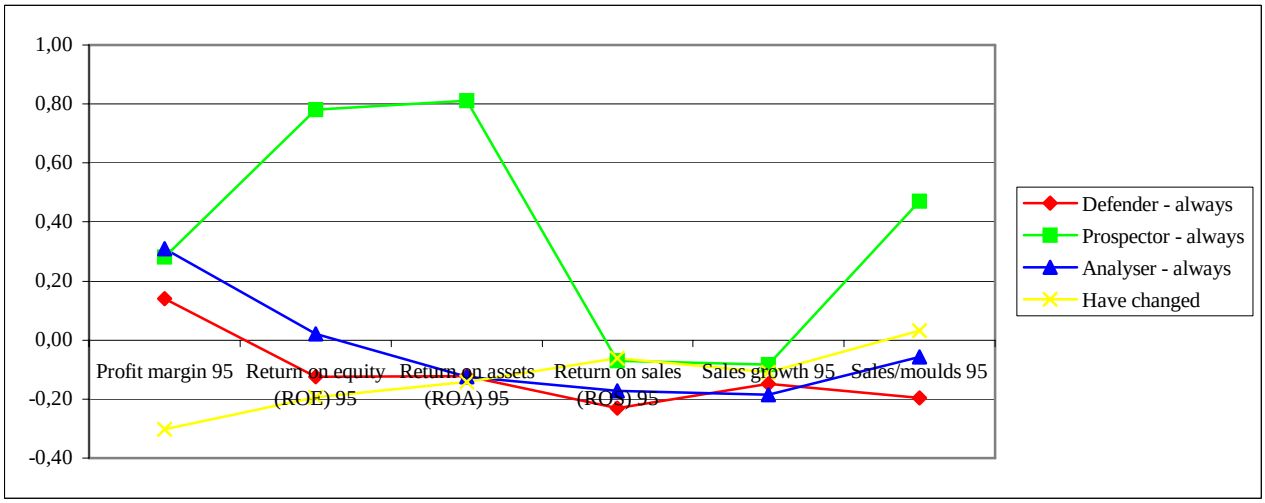
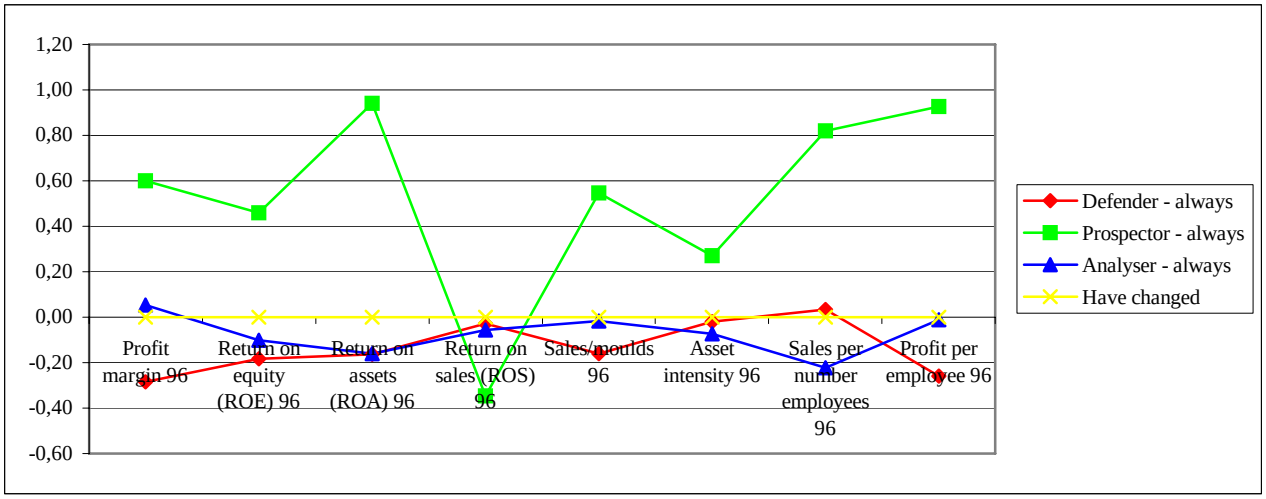


Figure 84 Cont. - Means, differences between *Stayer and Mover* strategic groups and organisational performance ratios, 1980-96

Figure 84D - *Stayers* and *Movers*, and organisational performance ratios, 1996



Note: To emphasise the strategic differences between strategy types, the mean was calculated for each item, and then subtracted from the total mean and divided by the standard deviation.

Figure 85 - Means, differences between patterns of *Stayers* and *Movers* for each strategy type, and organisational performance ratios, 1980-96

Figure 85A - Patterns of *Stayers* and *Movers* and organisational performance ratios, 1980-86

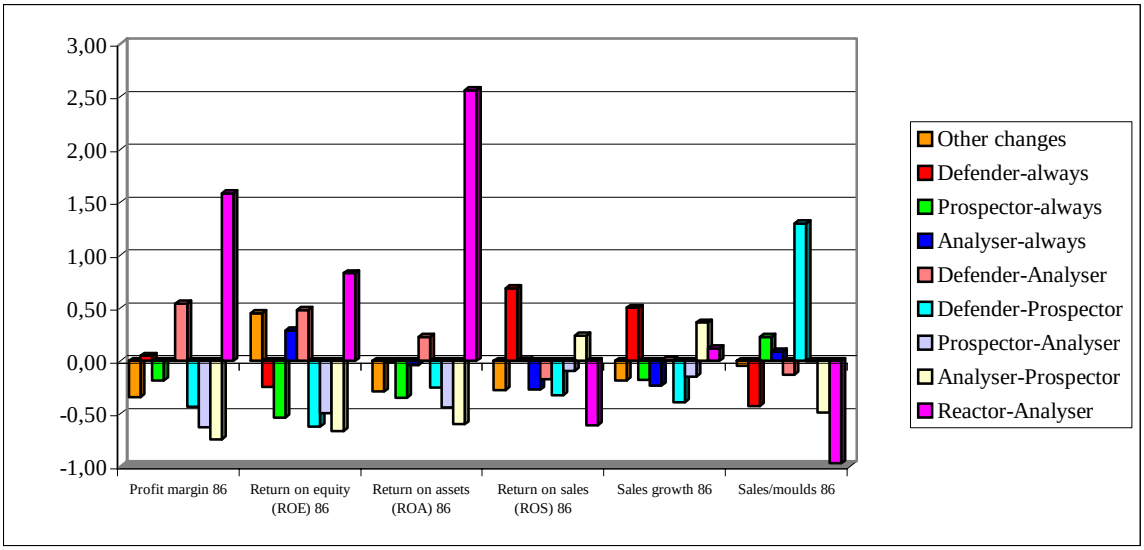


Figure 85B - Patterns of *Stayers* and *Movers* and organisational performance ratios, 1987-92

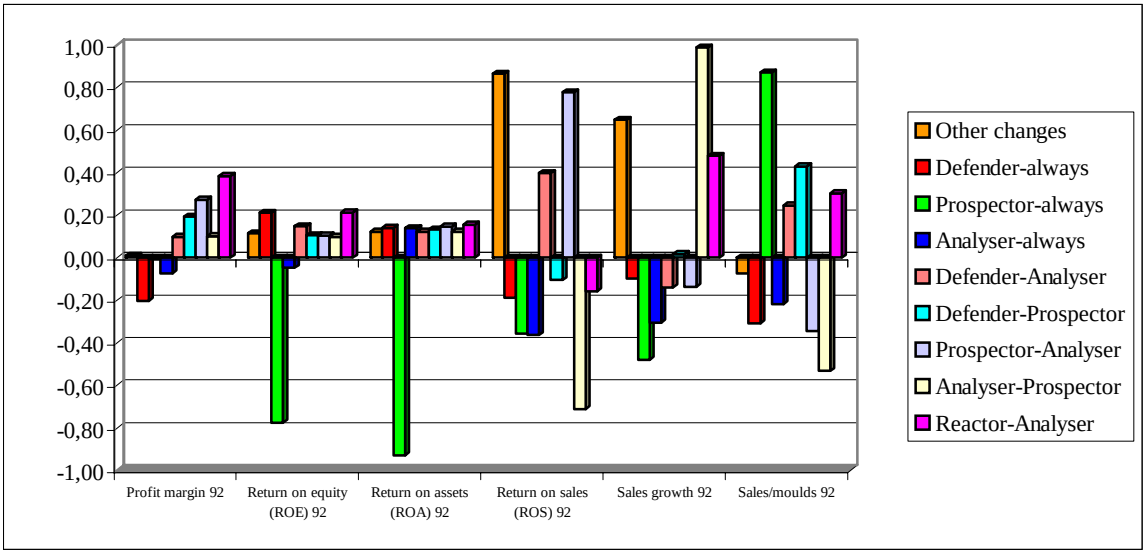


Figure 85C - Patterns of *Stayers* and *Movers* and organisational performance ratios, 1993-95

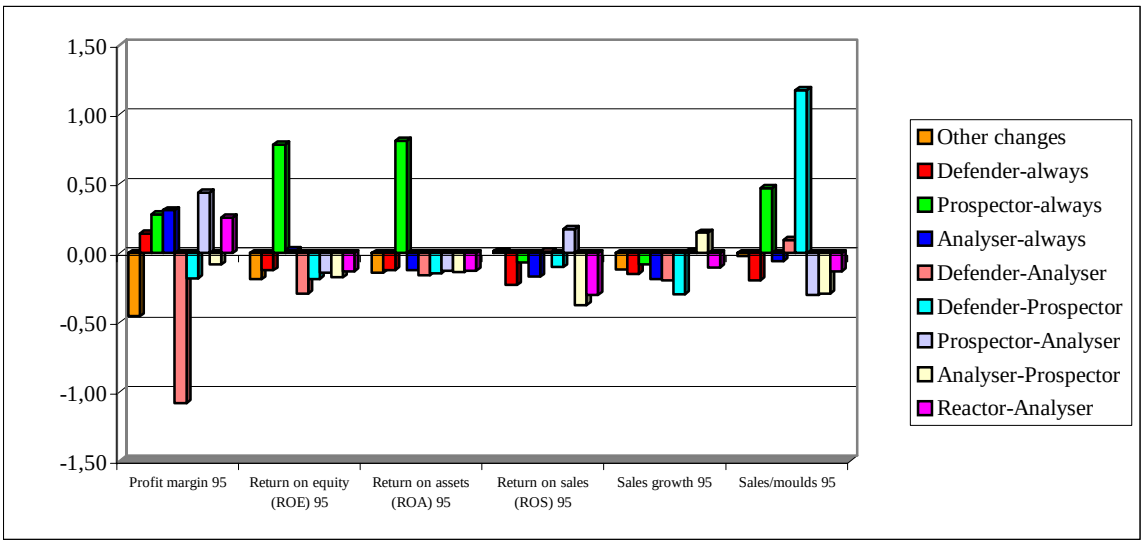
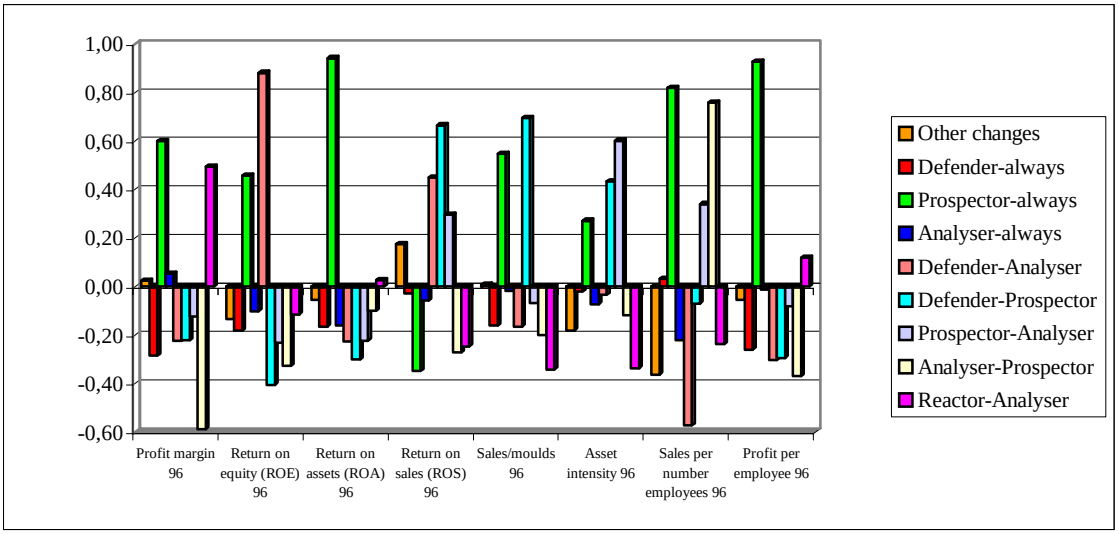


Figure 85 Cont.- Means, differences between patterns of *Stayers* and *Movers* for each strategy type, and organisational performance ratios, 1980-96

Figure 85D - Patterns of *Stayers* and *Movers* and organisational performance ratios, 1996



Note: To emphasise the strategic differences between strategy types, the mean was calculated for each item, and then subtracted from the total mean and divided by the standard deviation.

In summary, the analysis shows that in stable environments different strategy types outperformed others in different performance measures, i.e. there was no consistent pattern. However, in dynamic environments, *Stayer* Prospectors and Defenders-Prospectors clearly outperformed the other strategy types. Thus, being a Prospector (either *Staye*r Prospectors or firms that moved from Defenders to Prospectors) is a strategic behaviour to follow. Additionally, the results demonstrated that firms that changed to Prospectors may or may not outperform those that changed to Analysers or vice versa.

6.5. Testing the consistency of the Self-typing paragraph approach

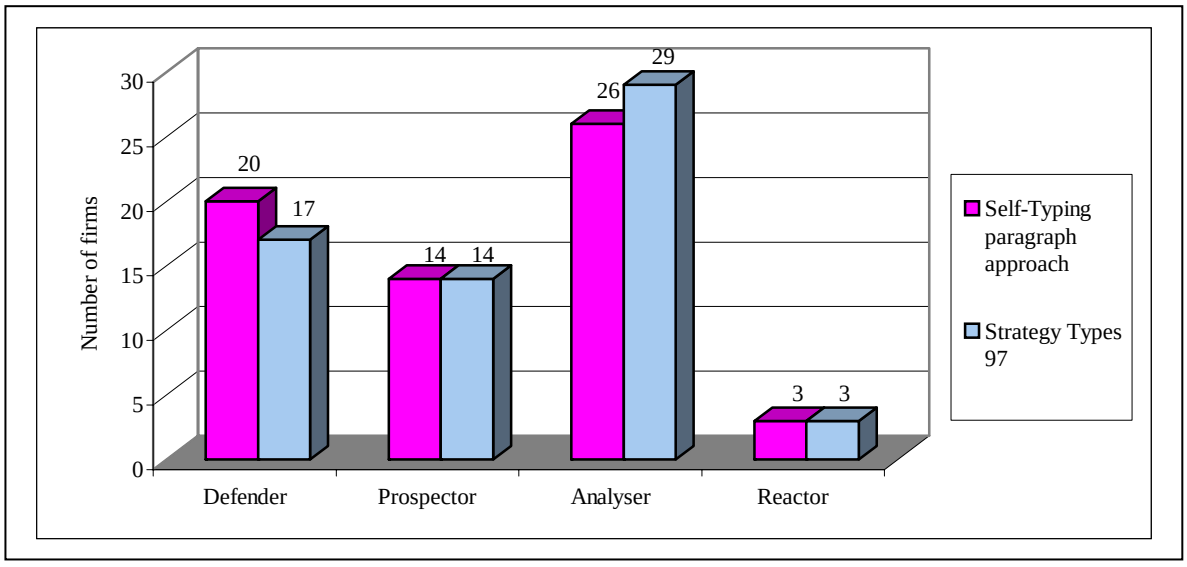
This section of the analysis relates to the study of the consistency of the *self-typing paragraph approach*. It explores whether the perception of the Portuguese mould makers was consistent with what the theory describes for each strategy type and the researcher's knowledge. The researcher's knowledge was based on the information gathered in interviews with managers and the unspoken information, e.g. visits to the manager's plants, observation of their surrounding environment, and secondary data.

According to Shortell and Zajac, (1990) and James and Hatten's (1995) results, the Self-Typing paragraph approach is an effective measure to identify strategic types. Consequently, the following hypothesis was tested:

H5. The self-typing paragraph approach is an effective means of identifying strategic types.

In order to test the hypothesis, the researcher printed out from SPSS a list of the Portuguese moulding firms with their respective names. Then, based on her own, knowledge each organisation was classified into a strategic type. The results were compared with what the managers said was their strategy for 1997. The findings reveal that the researcher's perception and the managers' identification of their strategic type was the same for 87% of firms. It is also interesting to see that smaller firms tend to identify their strategic behaviour one step forward from their reality; some firms identified themselves as Analysers, when in fact they act like Defenders. In contrast, some large firms were more modest; they identified their strategy as Analysers, when in fact they behaved strategically like Prospectors (see Figure 86). Therefore the self-typing paragraph approach sees to be a good measure to identify strategy types.

Figure 86 - Frequencies, the consistency of the self-typing paragraph approach

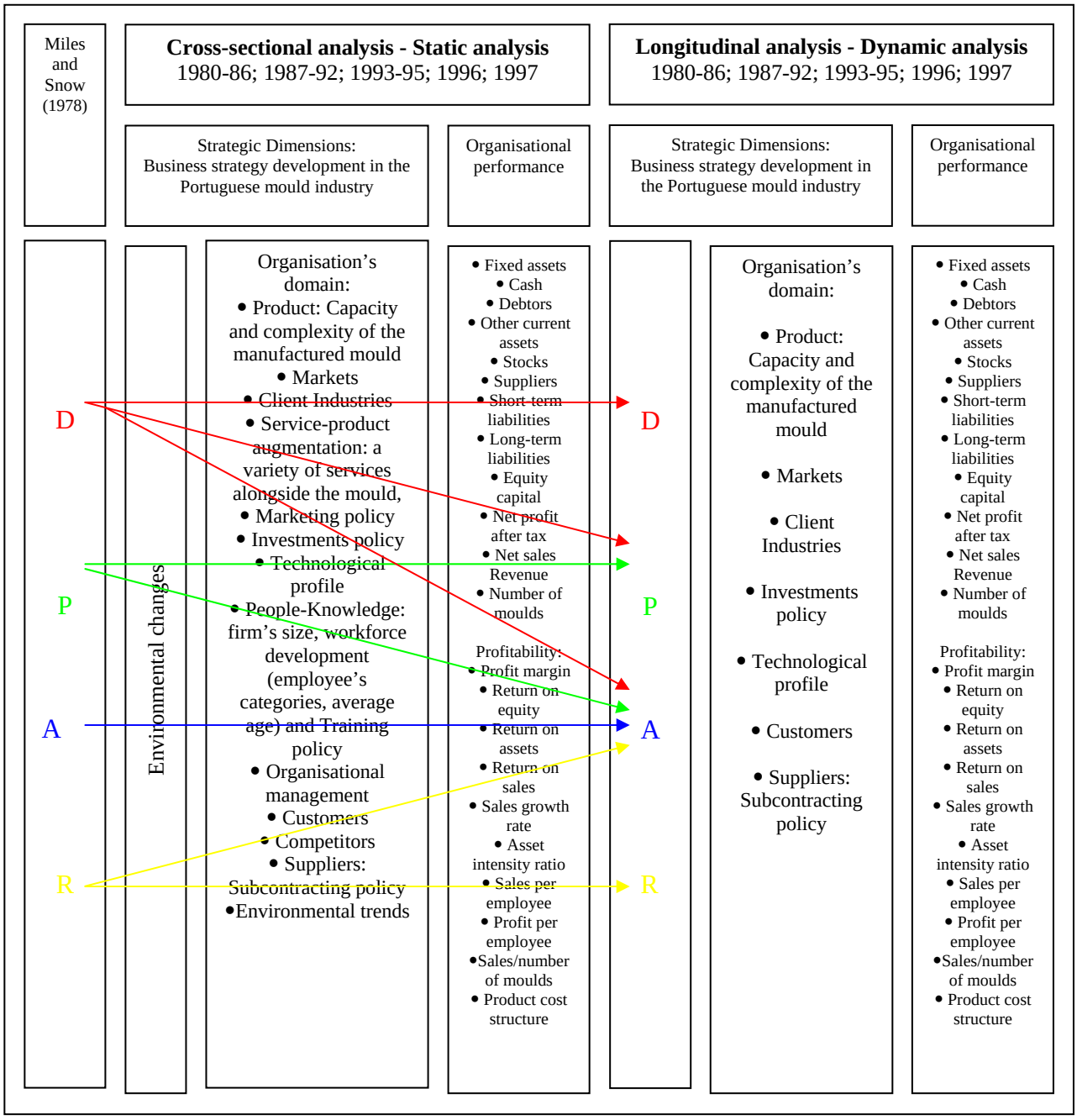


Following the analysis and discussion of the research findings, the following section summarises the most important outcomes.

6.6. The model of the current study

This section of the analysis develops the current research model (see Figure 87). The model illustrates that business strategy development for the Portuguese moulding sector comprises the choice of the capacity and the complexity of the manufactured mould, markets, client industries, services-product augmentation (services offered alongside the manufactured mould), marketing, areas of investment, technological profile, workforce and training policy, management capacity, benefits offered to customers, identification of competition, subcontracting policy and the identification of environmental trends. Each strategy, based on the above choices, entails a set of specific characteristics and these characteristics translate different levels of organisational performance. The model also shows that over the timescales there are firms that maintained their strategy - the *Stayers* and others that changed it - the *Movers*, each being characterised by a set of specific characteristics in terms of the capacity and the complexity of the manufactured mould, markets, client industries, areas of investment, technological profile, benefits offered to customers, and subcontracting policy and with different impact on organisational performance.

Figure 87 - The current research model



6.7. Conclusions from findings and data analysis

The research findings revealed that business strategy development for the Portuguese mould industry is about the selection of the capacity and complexity of the manufactured mould, markets, client industries, services-product augmentation (a

variety of services alongside the manufactured mould), areas of investment, marketing policy, technological profile, organisational size, workforce development, training policy, organisational management, benefits offered to customers, the understanding of the competition, the subcontracting business relationships and the identification of firm's opportunities and threats.

The analysis also showed that Miles and Snow's strategic typology is applicable to the Portuguese mould industry, and different strategy types are associated with different business profiles, which were on the whole consistent with the typology. Defenders relatively maintained their strategic pattern and Prospectors and Analysers changed their strategic stance. Reactors have not shown a consistent pattern.

There is a clear hierarchy of strategy types: Prospectors lead the markets and the client industries in terms of total sales, are marketing orientated, invest highly in R&D, have the fewest constraints on investment, invest in a varied technology, are large or very large firms, place most emphasis on training, identify management as a strength, perceive that their competition is widely located, and did not identify any item in which their counterparts were doing something significantly better than them.

An important outcome was also the identification of an intertwined network of business relationships that sustains and supports the industry development. There is a high interdependency between firms sustained on sectoral specialisation, and this interdependency nourishes the development of the industry.

From a static point of view the findings show that Defenders, Prospectors and Analysers outperformed Reactors. However, the notion that the three strategy types perform equally well in different environments was contradicted. Defenders outperformed the other strategic types in relatively stable environments and Prospectors outperformed the other strategy types in changeable environments. The findings corroborate the view that strategies do not perform equally well and are not equally viable across different environmental settings.

Firms do change their strategy type over time. Firms moved from Defenders primarily to Analysers and Prospectors. The findings support the notion that different environments favour different strategy types and that strategies are not equally viable across different environmental settings.

There are significant differences between *Stayers* and *Movers* strategic behaviour: *Stayers* tend to maintain their strategic stance while *Movers* tend to change it significantly, revealing the uncertainty of strategic change. Prospectors (*Stayer* Prospectors and Defenders-Prospectors) revealed to be the strategic group that score high in most strategic dimensions.

From a dynamic viewpoint the analysis showed that there is no consistent pattern between *Stayers* and *Movers* and organisational performance in stable environments. Different strategy types outperform others in different performance measures. However in dynamic environments Prospectors (either *Stayer* Prospectors or Defenders who became Prospectors) outperformed the other strategy types.

CHAPTER 7

Conclusions

7.0. Introduction

The aim of this chapter is to conclude the outcomes of the research project. The chapter comprises seven main sections. The first section outlines the purpose of the research (also showed in the introduction chapter). The prime objective here is to establish a link between the research aims and the research findings. The second section illustrates the uniqueness and originality of this study. It identifies those elements that have been surprisingly neglected in the literature and that the research attempts to explore. The research findings resulted in major theoretical and managerial implications, constituting the third and fourth section respectively. The third section illustrates the research findings that corroborate or contradict the findings of earlier researchers. Here the objective is to show empirical evidence to confirm or reject the hypotheses developed (that test Miles and Snow's strategic typology, the dynamics of strategy and the overall implications on organisational performance, whether from a static: cross-sectional analysis or dynamic viewpoint: longitudinal analysis). The fourth section outlines important contributions to practitioners: i.e. sectoral and government business strategy policy makers. It also suggests a set of possible strategic orientations for firms to increase their competitiveness. The fifth section illustrates the significance of the research results and claims to knowledge. Finally, the sixth section identifies the limitations of the research and the seventh section suggests areas for further research.

7.1. The purpose of the research

The research endeavoured to understand business strategy development, the dynamics of business strategy and the overall implications on organisation performance in the Portuguese mould manufacturing sector. It therefore aimed to:

- Test the applicability of Miles and Snow's strategic typology to the Portuguese mould manufacturing industry, using a series of cross-sectional studies covering the period from 1980 to 1997 in five tranches.
- Test the dynamics of Miles and Snow's strategy types, using longitudinal analysis, specifically to:
    - Explore how business strategy has evolved over the years in response to environmental changes (from 1980 until 1997).
    - Investigate how firms adapted to the changing environment; whether firms changed their strategic behaviour over time (discontinuous changes) or made minor adjustments (incremental changes).
    - Discover the pattern of change between different patterns of behaviour
- Test the overall implications of the static and the dynamic viewpoint of Miles and Snow's strategy types on organisational performance.
- Test the consistency of the self-typing paragraph approach to identify strategy types.
- Develop an in-depth understanding of how the specific business sector operates, i.e. the meaning of strategy and the process of business strategy development for the Portuguese mould managers, and their context. This understanding is an important input to the development of industrial policy and strategy.
- Provide a model that illustrates and explains the above inter-relationships, i.e. a framework that allows an integrated analysis of business strategy, the dynamics of strategy and organisational performance.

The analysis of the literature allowed the identification of gaps that need to be filled, and this represents the uniqueness and originality of the research.

7.2. The uniqueness and originality of the research project

The gaps in the literature, the uniqueness and originality of this research, are described as follows:

a) Researchers have mainly tested strategic typologies in the American context. This research attempts to contribute to further understanding of strategic typologies by testing the applicability of Miles & Snow's strategic typology in Portugal.

b) As Namik (1989:73) stated: "strategic typologies need to be tested for validity and usefulness through empirical investigation". Miles and Snow's strategic typology has been used in a wide variety of settings of industries and services (e.g. manufacturing, banks, chemical industries, churches, colleges, civil construction, electronics, hospitals, insurance, retailing, and tobacco). However the study of the mould industry, and in particular of the Portuguese mould manufacturing industry, has been neglected. The current research analyses the Portuguese mould manufacturing industry.

c) Most researchers have concentrated their studies on exploring only one, or very few, business strategic dimensions, e.g. marketing, technology, etc. To understand business strategy development and which factors craft strategy, the current study undertakes a comprehensive research of business strategy. It overviews the literature on an organisation's internal competences (product/service-market domain, marketing, investments, technology, people-knowledge, and organisational management) and on the organisation's external environment (customers, competitors, suppliers and environmental trends).

d) With the exception of very few researchers, the dynamics of business strategy has been surprisingly neglected in the literature. This study analyses the dynamics of Miles and Snow's strategy types, using a longitudinal analysis, with data from 1980 to 1997. The timescale allowed the analysis of the realised strategy (1980-86, 1987-92, 1993-95), the current strategy (1996, year to which the data related) and the intended strategy (1997, a forecast).

e) There is no known research exploring the relationships between Miles and Snow's strategic typology and organisational performance, both from a static and a dynamic viewpoint, particular to the Portuguese mould industry.

f) Most researchers have only used one or two organisational performance measures. The current study has used a set of financial performance measures. It also has employed financial ratios as performance measures rather than subjective self-report measures of financial ratios, i.e. the subjective evaluation of a firm's performance compared to its competitors. Additionally, organisational performance measures were provided for the 1980-86, 1986-92, 1993-95 and 1996 periods, which has allowed the analysis of the impact of the dynamics of strategy on organisational performance.

The research generated important academia and managerial outcomes, which are described and discussed bellow.

7.3. The theoretical implications

Exploring Miles and Snow's strategic typology, from a static viewpoint

The applicability of the four Miles and Snow's strategy types

A key finding is that the Miles and Snow's strategic typology is cross-culturally and cross-sectorally applicable in that it is applicable in Portugal and to the mould industry - a different cultural and industrial setting from the ones in which it was originally developed. However, Miles and Snow's (1978) notion that Defenders, Prospectors and Analysers are roughly equally distributed was contradicted. Defenders outnumbered other strategy types in stable periods (1980-86, and 1987-92), and Analysers in dynamic periods (1993-95, 1996 and 1997). This is an important finding in that this corroborates the notion that different environments favour different strategy types and that strategies are not equally viable in different environmental settings. This demonstrates that firms need to change their strategic behaviour as prevailing

environmental conditions change. This finding strongly reinforces the importance of this study in that prior studies have largely focused on undertaking a static analysis where the interplay of strategic stance and prevailing environment could not be explored. A major contribution of this study is the dynamic, time-series analysis, which reveals how firms have changed their behaviour as the business environment has changed. In stable markets, firms could act as Defenders by seeking to preserve longstanding relationships with customers in "traditional" product-markets. However, as firms' competitive positions in certain sectors were undermined by low cost competition for business, the Portuguese firms had to react by increasing the size and complexity of the moulds they produce and by looking for new sectoral and geographic markets.

The Entrepreneurial problem

On average, as suggested by Miles and Snow (1978), Defenders were most likely to maintain their product-market domain (the capacity and complexity of the manufactured mould, markets and client industries), while Prospectors and Analysers were most likely to change it, with Reactors having no distinctive and consistent pattern. Firms changed their product-market domain in order to adapt to the changing competitive environment. Prospectors and Analysers were found to have displayed radically different behaviours from Defenders and Reactors. Support was found for Miles and Snow's (1978) assertions about this issue. The research has revealed a high level of differentiation between different types of firms in terms of their geographical and sectoral markets, and the nature (size and complexity) of the moulds they produce. Prospectors produce mainly very large moulds of medium and high complexity. They are the strategic group with the highest market and client industry values in terms of total sales, and they sell mostly to European countries and to the automotive industry. Prospectors also offered a variety of services alongside the manufactured mould, and placed a greater emphasis on marketing than Defenders. Prospectors were the group that invested most heavily at times of most rapid environmental change and were the type of firm that identified the fewest items as constraints on investment. The results supported Miles and Snow's view that Prospectors have the most pronounced

marketing orientation and the highest level of innovativeness. Defenders were found to produce primarily medium sized moulds of medium complexity; they sell mainly to the American market and to the domestic utilities industry. In stable environments Defenders were the group that invested most. The research has also revealed a "leader-follower" relationship between Prospectors and Analysers, which is of considerable importance to understanding how the sector operates as a basis for the design of sectoral and industrial policy as interventions focused on Prospectors can be expected to cascade down the complex network of inter-firm relations in the sector. Consequently, an insight that emerges from this research is that industrial policy needs to be selective and focused on a number of sector-leading firms.

The Engineering problem

The findings suggest that different strategy types have different technological priorities, which may be related to their access to resources (especially financial resources). The findings underline a technological hierarchy of strategy types. They also reveal that firms have low levels of technological productivity, which is an issue of some concern in a product market that is becoming more competitive and differentiated. These findings are significant because they show that there is an urgent need to increase the levels of technological productivity in the Portuguese mould industry if the industry is to achieve the objectives being set for it by Portuguese industrial policy makers. Indeed, this study has identified a wide range of issues and many new understandings of how the sector operates, which will be of major importance to national and regional industrial policy makers. These issues concern factors such as differential access to capital; differing concerns over labour supply; and differing marketing capabilities from different types of firm.

The inconsistencies found for Defenders regarding the re-engineering time-cycles, and technological productivity (working in shifts and automation ratio), may be related to the size of Defenders (which according to the theory "should" be large firms, but in the Portuguese mould industry are predominantly "small" firms – this is an area where there is some considerable discordance between the expectations derived from the

literature and the findings from the investigation). Small firms have different strategic behaviours from large firms; their business strategy is different and is often set according to their access to resources. Overall, these findings support the engineering dimension of Miles and Snow's strategic typology. However, the inter-relationship of firm-size and strategic behaviour is a field where more research is clearly required.

The Administrative problem

Contrary to the expectations derived from the literature, the analysis demonstrates that Defenders were small firms and Prospectors large or very large firms. As expected, Analysers were medium and Reactors small firms. These findings are particularly relevant in explaining the strategic differences between strategy types. Defenders, as small firms, behave strategically in a different way than Prospectors - as large firms. Smith et al.'s (1989) results also contradicted the theory related to the size of strategy types. The inconsistencies found between the research findings and Miles and Snow's (1978) findings related to size and strategy types (Defenders and Prospectors) may be a result of particular characteristics related to the growth and development of the Portuguese mould industry. Prospectors are those firms that were founded in the very early phase of the development of the sector (in the 60s and 70s), and they grew with the sector. Prospectors are often run by one or two partners and are mostly family-owned and managed businesses. Defenders are often those organisations that were established when the sector was booming in the 80s. Defenders were often established around a specific expertise in mould manufacturing: they often have larger numbers of partners (between four and nine partners). The high number of partners is also related to the shortage of financial resources to buy the necessary but expensive technology. An area of further research would be to examine the relationship between the strategic behaviour of firms and their governance arrangements.

The findings also revealed that Prospectors still perceive a shortage of qualified human resources in the market place to be a key issue. These findings are significant for government policy makers, as it appears that the lack of well skilled workers to working in these leading edge companies is a major impediment to the future

development of the sector. These shortages will also have spillover effects for firms further down the sectoral hierarchy that this research project has identified. Clearly, it is a major issue for public policy if the leading edge of the sector is being blunted by shortages of skilled labour. While several measures have been undertaken to overcome this gap, many more are clearly still needed. This problem also relates to the low levels of technological productivity shown above as the shortage of a qualified workforce jeopardizes firms' ability to make progress on improving technological productivity. In order to overcome this gap, the majority of firms claimed to have a training policy, particularly with regard to the use of technology, quality control and product definition. Nonetheless, Prospectors are the strategic group that gives most emphasis to training, including issues such as strategic management, customer relationships and marketing. Prospectors once more have revealed their leading role. This contrasts with Defenders who are more likely to cite problems with labour costs and are less likely to invest in training.

The organisation's external environment

Customers

The findings revealed that from 1980-97, firms increased the benefits they offered to their customers. In dynamic environments (from 1987-92 onwards), Prospectors scored higher on most of the benefits offered. According to the theory, Prospectors are most suited to dynamic and changing environments. The research findings corroborate the notion that different environments favour different strategy types.

Competition

Defenders identify their competition as being local as their trading relationships generally tended to be more highly localised than other types. Prospectors, on the other hand, perceive that their competition is more widely located. The findings suggest that managers are aware of their weaknesses as well as their counterparts' strengths. The findings also reflect a hierarchy of strategy types: Prospectors, as the

market leading type, understand that their counterparts are not doing anything significantly better than they themselves are. These findings are important, because for the first time they show, empirically, where the Portuguese mould maker's competition is located and what firms think that their competitors are doing better than they are. An interesting further study would be to produce a deeper analysis of competition in order to analyse whether the Portuguese concerns related to the industry are unique, or whether they are general concerns of mould makers worldwide, and whether business strategy development follows the same process in other countries.

Suppliers-Subcontracting policy

All firms subcontract to one another and the network of relationships has been shown to be very complex. Firms have built a network of business relationships in which all depend on other companies. Prospectors, the top of the strategic type hierarchy, subcontract to Defenders or to Analysers, but Analysers and Defenders subcontract to Prospectors. Analysers subcontract to Defenders. Defenders subcontract to micro firms and to specialised service firms in the sector. Analysers and Defenders also subcontract technological and training services to CENTIMFE and CENFIM. These findings reveal a clear hierarchy of strategy types and an intertwined network of business relationships embracing large, medium, small, micro size and institutional firms to share information, knowledge, experience and technological developments to increase business competitiveness. The findings show that there is a high interdependency between firms, sustained by the development of their own particular distinctive competencies (business specialisation). The sectoral specialisation sustains the development of the industry and generates added value for firms. It would appear that firms are becoming more specialised as the environment becomes more competitive: consequently, it is expected that the pattern of relationships among increasingly specialised firms will become more complex. The analysis of subcontracting has provided useful information about the organisation of the industrial sector, the supply chain and the nature of the linkages between different firms within the mould industry. The insights gained about the organisation of the industrial sector are directly relevant to the development of industrial and sector development policy, as

it is essential to understand the nature of the supply chain and the pattern of sub-contracting to underpin the development of effective and well-targeted policy.

Organisational environment

It is suggested that firms' perception of their environmental opportunities or threats may be related to their size. Prospectors, as large firms, are more likely to be aware of the Eastern European countries as potential competitor. Defenders identified intermediary-trade firms as a threat, suggesting some kind of unease in their relationships, which may jeopardise the sustainable intertwined business network relationships in this industry. As small firms, Defenders are highly dependent on intermediary-trade firms to sell abroad, as they do not have the resources or skills to develop overseas markets directly. Defenders need, and expect the government to create, incentives to help them to increase competitiveness. This is an important outcome for government policy makers, as it shows discontent on the part of Defenders with the government's role.

Exploring the relationships between Miles and Snow's strategy types and organisational performance from a static viewpoint

As expected, on all the performance measures used, and for the timescales analysed (1980-86, 1987-92, 1993-95, 1996), Defenders, Prospectors and Analysers outperformed Reactors. However, the notion that the three strategy types perform equally well in different environments was contradicted: Defenders outperformed the other strategy types in relatively stable environments (1980-86 and 1987-92) and Prospectors in changeable environments (after 1987-92). The findings corroborate the view that firms that adopt different strategic stances do not perform equally well and are not equally viable across different environmental settings. These findings show that certain environments favour firms that adopt certain strategic behaviours over others. This is a major finding of the research that has implications for policy. Clearly, as the business environment is becoming even more dynamic and less stable, it is hard to see any long term future for firms that maintain the stance of a Defender. A focus of government policy should be to attempt to encourage Defender firms to change their

behaviours and to develop their business. However, given that the Defenders tend to be firms with larger number of partners, this may prove difficult as these firms may have become "lifestyle" Defenders.

Contrary to expectations, the findings indicate that Defenders outperformed Prospectors on Return on Assets (ROA - the performance measure to access efficiency) but only in stable environments (1980-86 and 1987-92). Defenders, rather than Prospectors, outperformed the other strategy types in terms of sales growth (the performance measure to access in product and market effectiveness) but only in stable environments. The findings are important because they revealed that, for the Portuguese mould industry, performance differences between strategy types depend less on the performance measures used than on the nature of the environment that firms are operating within – this is as Hambrick (1983) suggested. Also, contrary to expectations, Defenders performed better as small firms and Prospectors as large firms with support being found here for the findings of Smith et al. (1989). The inconsistencies found to the theory may be a result of the differences in the firm size distributions of strategy types in this industry, which reflect the particular characteristics of this industry's history and development.

Additionally, the findings demonstrate that Defenders (except in relation to the workforce) had the lowest cost structure. The findings corroborate the view that Defenders tend to be more efficiency-oriented (i.e. concerned with managing costs and being low cost producers in markets where firms tend to compete more on cost than on value added) than Prospectors.

Exploring the dynamics of Miles and Snow's strategy types

The findings reveal that, first, firms do change their strategy type over time in response to changing environmental and competitive circumstances. Second, they show that strategies are not equally viable across different environmental contexts - thus particular strategies are not equally viable over time as environmental conditions

change. The findings support the notion that certain environments favour certain strategy types. Third, the study has revealed a degree of consistency and a pattern in the way that firms changed their strategic stance in response to changing environmental conditions: as expected from the literature, under major environmental changes firms changed primarily to Analysers (i.e. the category deemed to indicate a balanced strategy): this is an important finding of the study. Fourth, the findings reveal, contrary to the literature, that Reactors are capable of change and strategically re-orientating themselves, though this may be in part due to changed ownership and control of the firm, which may be related to a succession of ownership.

Additionally, the analysis explored differences in aggregate between *Stayer* and *Mover* strategic groups, and then among the strategic groups, explored differences between patterns of *Stayers* and *Movers* for each strategy type. The analysis illustrates that *Movers* have different business profiles from *Stayers. Stayers* maintained their strategic behaviour over time: they defined their business strategy and, in order to adapt to the changing environment, they endeavoured to achieve convergent and incremental changes to reinforce their strategy over time. It seems that somehow they were able to anticipate how their business strategy need to evolve within their chosen behaviour in response to a dynamic environment, and they managed, by and large, to "get it right". *Movers* tended to change their strategic pattern quite often. They often undertook major changes. Their values often vary significantly from one period to another, reflecting the uncertainty that a change of strategy can cause. The findings also showed that, when analysing the patterns of *Stayers* and *Movers* for individual types of firm, Prospectors (whether *Stayer* Prospectors or Defenders who became Prospectors) account for the highest values on markets, client industries, areas of investment, technological investments and benefits offered. These findings are important for managers and government policy makers: Prospectors have the strategic behaviour to be pursued by other strategy types. It appears that the change of strategy and the inherent uncertainty has a negative influence on business strategy effectiveness. The findings also have significant theoretical implications. Previous studies have analysed how firms have moved from different strategy types to others,

but this study has taken a more long-term view, looking at transitions over several time periods, to see how strategy has evolved in firms, and to identify patterns over time.

Exploring the relationships between the dynamics of Miles and Snow's strategy types and organisational performance

The analysis has revealed that in stable environments there is no consistent pattern between *Stayers* and *Movers* and organisational performance. Different strategy types outperformed others in different performance measures. However, in dynamic environments, *Stayer* Prospectors and Defenders who became Prospectors clearly outperformed the other strategy types. Thus, being a Prospector (either *Stayer* Prospectors or firms that moved from Defenders to Prospectors) is a strategic change behaviour that seems to be associated with achieving higher levels of performance. Clearly, this is an import finding as this could be used by policy makers to indicate to *Stayer* Defenders that business performance can be radically improved by making the Defender-Prospector transition. Firms - especially Defenders - need to be made more aware that changing their strategy can lead to increased levels of performance. In this study, the majority of firms were found to have changed their strategy to Analysers – an intermediate position between Defenders and Prospectors. However, for firms that have changed from Defenders to Analysers, this has not been generally accompanied by higher levels of performance. This research shows that the highest levels of performance are generally achieved by Prospectors.

Testing the consistency of the Self-typing paragraph approach

The Self-Typing paragraph approach seems to be an effective means of identifying strategic types. Support was found for Shortell and Zajac, (1990) and James and Hatten's (1995) results. More empirical studies can be developed by using this measure to identify Miles and Snow's strategy types in different cultural and sectoral settings.

7.4. Managerial implications

The Portuguese mould manufacturing industry contributes significantly to the economy of the Central Region of Portugal and to the national economy. Strategic management data is almost inexistent; so the Portuguese mould makers need information that can help them to better understand strategic behaviour and how this affects organisational performance. More important, knowledge of the strategic management behaviours of firms is rarely used in regional or industrial policy making. On the assumption that regional economic performance will be driven by the individual and collective performance of firms, it is important for policy makers to understand how firms make decisions about which pattern of strategic behaviour to follow. It is also important for policy makers to understand what the impediments are to certain types of firms changing their strategic behaviours as competitive conditions change and it is also important for them to understand how a firm's decision to change its strategic behaviour can affect the way that the firm (and ultimately the sector) performs. This research has yielded a number of important findings that are directly relevant to industrial policy formulation. In an attempt to fill this gap in policy makers' knowledge, the research aimed to develop an in-depth understanding of how the specific business sector operates by taking a very wide view of how firms in the sector had behaved and performed over many years. The research has provided a robust and rich understanding of the meaning of strategy and the process of business strategy development for the Portuguese mould managers. This understanding is an important input to the development of industrial policy and strategy.

Business strategy development for this industry comprises the choice of the capacity and complexity of the manufactured mould, markets, client industries, services-product augmentation, areas of investments, marketing policy, technological profile, organisational size, workforce development, training policy, organisational management, benefits offered to customers, the understanding of the competition, the subcontracting business relationships and the identification of firms' opportunities and threats. Based on these strategic dimensions, the research developed a model that

attempts to explain and predict business strategic behaviour, the dynamics of strategy and the overall interrelationships with organisational performance. The model enables a holistic view of business strategy and endeavours to help managers in their process of decision-making. As suggested by Snow and Hrebiniak, (1980), researchers can help managers in designing their organisations by offering them alternative models of complete organisations systems which are effective within a given industry

In order to help government and sectoral policy makers, and firms (particularly Defenders and Analysers) to increase competitiveness in the sector, this research project has been used to develop a set of suggestions for improving the performance of the sector. The suggestions are described below:

- *Defender managers have demonstrated discontent with some intermediary-trading firms.* These firms act in an intermediate position between mould producers and the market. They exist because some firms do not have the skills and competencies necessary to undertake this role themselves. In order to overcome this problem, it is imperative that the role of intermediary between mould producer and consumer is managed in a different way. It is suggested that actions here could be coordinated by CEFAMOL, CENTIMFE, CEMFIM and ICEP - the organisations that represent the sector. However, other actions need to be taken within Defender firms to encourage them to develop the competencies necessary to undertake this intermediary role either within the firm or cooperatively. The study has identified that there are clear inefficiencies in the market operations of certain types of firm.
- *Develop knowledge.* Knowledge is the most important tool that can be given to managers, and the one that really gives the competitive edge. As Neto (1985:30) suggested: “the future belongs to knowledge, independent of the economic, social, or political system in which we believe”. To overcome the lack of knowledge management (e.g. integrated costs control, total quality management, marketing, strategic management, international business) identified by firms, specific courses should be administered with the support of CEFAMOL, CENTIMFE, CEMFIM, ICEP and universities. This would help

managers to enrich their knowledge, to gain more up-to-date business skills and to obtain a better insight into strategic management and its implications for business decisions on a range of fronts, from product complexity to the choice of geographic and sectoral markets. Clearly, these need to be focused on firms that currently display Defender or Analyser behaviours. Courses, for instance, on how to deal with customers from different cultures (e.g. Japanese, Chinese, Russian) and how to do business internationally might prove productive for Defenders and Analysers.

- *Emphasise the development of knowledge networks.* The establishment of knowledge networks with all the parts that interact with the organisation (e.g. employees, customers, competitors, suppliers, sectoral institutions, government or universities-whether Portuguese or foreign) is essential for organisational development and the creation of customer added value. These networks allow the sharing of knowledge, experiences, information, and learning. They allow the establishment of collaborative relationships and flexibility. They foster organisational knowledge and therefore, firms' competitiveness. The study has revealed a complex pattern of inter-relationships already exists within the sector. Knowledge of the nature of these relationships will be invaluable to the dissemination of information and best practice.
- *Develop expertise teams of interdisciplinary issues.* These teams would comprise experts from diverse areas e.g. strategic management, engineering, technology, product development, design, accounting, thermoplastics, and international business. They would analyse firms' strategic behaviour and their problems and they would help managers to find the appropriate solutions and to implement them. The aim is to increase firms' competitiveness. These teams should operate with the support of CEFAMOL; CENTIMFE, CENFIM, ICEP and the universities. Through CEFAMOL, firms could request consultancy by a project team project. Firms would pay for the consultancy work but at a symbolic price. The expenses should be met mainly by governmental institutions (e.g. ICEP and DGI, IAPMEI). This would create a real added value for firms, their customers and consequently for the industry because

these project teams would not only analyse firms' strategic behaviour but also present solutions and help managers to implement them.

- *Develop continued market research.* The production of regular information about the sector is of extreme importance because it helps managers in the definition of their strategic orientation and in their decision-making processes. Market research would help to understand how markets operate, what the customers' needs are, the industry's problems, to identify potential new markets-customers (which plastic industries will grow and those that are expected to decline), new products, technologies, new composite materials, organisational processes, organisational strategic behaviour, legislation, sectoral attractiveness and to understand competition (benchmarking studies) among other issues. Market research should be target at all those issues that directly or indirectly contribute to better understand the sector and increase firm's competitiveness. Market research should be encouraged and promoted by government and sectoral institutions. Market research can only succeed if firms collaborate with researchers and provide them with the information required (managers must be aware that it is only through research that they can be helped). In turn, the market research should produce outcomes that effectively help mangers to create value. As a result, synergies should be gained in order to identify competencies and overcome difficulties. This is important, because the competitive advantages of the mould industry are nowadays mainly based on knowledge, technology, and customer added value rather than on low costs. Again, the study could be used to target this information on those firms that do not have the capacity to conduct this type of work for themselves (i.e. Defenders and to some extent Analysers). However, steps need to be taken to ensure that intelligence gathered by Prospectors and the more able Analysers is cascaded down through the supply chain and the network of business relationships which have been found to exist. However, the definition of "market research" needs to be construed is a rather wider sense than the traditional view of market research: perhaps "sector intelligence" would be a better phrase here.

- *Firms should develop their strategic analysis capability*. Firms must be aware of their organisation situation and the performance relative to other similar firms (efficiency and product-market effectiveness). They may need to make tradeoffs and strategic analysis can be an important tool. Strategic management has been found to be a weakness in many firms (especially Defenders and some Analysers which could only be described as "myopic"). Clearly, many firms need to become more strategic in the way they manage their products and the markets and sectors they operate within if the sector is to develop its competitiveness. The study has revealed that this deficiency should be a major target for government action.
- *Training polices should continue to be emphasised.* There is a general concern of the shortage of skilled workers to operate new technologies to deliver the new products and services that an evolving market needs. The study has identified a real concern about the low levels of technological productivity in the industry, which is of added impact given that the mould industry is capital intensive and, in order to survive and develop, will have to become more capital intensive. So, to increase firms' competitiveness, there is an urgent need to take full advantage of technology and therefore to have qualified human resources. Training should be emphasised at all organisational levels**.** It is important to provide specific training for those manufacturing tasks (e.g. polishing, finishing) where employees have long-term experience but are near to retirement but there is no one to replace them. However, training should be not only about how to deal with new technologies but also about new management systems that give firms sustainable growth and make them more efficient and effective.
- *Firms should specialise.* An outcome of the analysis is that it would appear that there is little future for "general purpose" firms, and that firms should learn to specialise, whether this is through their mould production (i.e. increasing the capacity and complexity of the manufactured mould) or through changing geographic or sectoral markets, changing their technology base or in the development of specific services located within a supply chain or industrial complex. Firms should specialise in those segments in which they have really

distinctive competences and can create barriers against others entering the industry. Specialisation implies that firms make trade-offs. Firms should make a clear distinction between whether they wish to pursue effectiveness (i.e. developmental) or an efficiency orientation (i.e. compete on cost), and as a consequence of that decision, seek to enter those market segments where they can compete most effectively. They should analyse their sales historically and decide to withdraw from those market segments (products, services, or markets) that represent marginal sales and which do not add any value for the organisation. It is as important for firms to decide what to do, as it is to decide what not to do (Porter, 1996). Specialisation involves the selection of markets and client industries in which the Portuguese mould makers can take advantage of their core competences: which the study has revealed to be long term experience, knowledge, know-how and technical expertise. Therefore, mould makers should specialise in added value moulds, moulds that are highly technical, highly complex and of high quality, which they can offer at competitive prices - they should avoid price-sensitive customers as they cannot compete on price alone given the nature of world competition. Increasing specialisation will lead the industry to offer a variety of complex products and services, which may involve both upstream and downstream operations. If the government is to support the sector effectively, an understanding of these issues is absolutely essential: it is contended that this is a major contribution of this thesis.

- *Firms should be involved in and committed to the creation of customers' added value*. Firms must understand the needs and fulfil the expectations of customers. It is in this area that an attribute of defenders (i.e. maintaining long term customer relationships) may be an advantage. Customer relationships should be emphasised (customer trust and customer care). Firms should establish networks of knowledge with their customers. They should be involved in the customers' product project development, and they should move upstream or downstream on the value chain in order to offer a complete service (the mould and complementary services alongside the mould). This may involve partnerships with other firms in areas in which they do not have

specific competencies. These partnerships may include subcontracting with specialised firms. This allows firms flexibility at the same time as increasing customer added value. The Portuguese mould makers should be involved in the creation of the products of the future and should contribute to their appearance in the market place more quickly than their competitors. The products of the future will be those that are: attractive (with a good design), ergonomic, multifunctional (flexible for several uses), portable (light - easy to transport), that allow interactivity with customers (which means customisation and entertainment), are of reasonable quality and price and are easy to order and to obtain (good distribution channel and short delivery times).

- *Firms must innovate*. Generally, innovations are associated with the acquisition of the most recent technologies. It is important that firms continue to invest in new technologies (e.g. high speed machining), however, innovation is also about new products, plastic raw materials and composites, new manufacturing processes, new techniques (e.g. concurrent engineering), the implementation of new management and information systems (that control and use resources more efficiently and effectively, improve communication, use multidisciplinary and cooperative work, control costs and workforce performance), new policies and the development of procedures and processes that help managers in their decision-making process. Innovation in the Portuguese mould industry can spread very quickly, due to its geographic concentration and the well developed networks that exist within the sector. However, government intervention may be required to further facilitate the process of innovation diffusion. Given that Prospectors are often leaders in new product development, it is important to develop networks around these leading firms to diffuse innovation down through the supply chain that this research project has revealed.
- *Firms must invest in R&D.* R&D should be pursued through the establishment of collaborative relationships among mould makers, universities, town councils, sectoral institutions, technological centres and the agencies that represent the mould sector. Activity here needs to be developed in partnership with the support of the private (firms and sectoral institutions) and public

sectors (e.g. IAPMEI, the institute for the development of SMEs, Department of Industry, universities, town councils, ICEP and the Economic Ministry, etc.). The main goal is to promote innovation and help those that create it, to develop and implement the projects that can effectively help firms to become more competitive.

- *The image of the quality of the Portuguese mould makers should be diffused and heavily promoted around the world.* There is a general idea that products *made in Portugal* are cheap and of bad quality. The image of the country is a problem. A recent study[1] showed that customers, offered a choice between Italian and Portuguese shoes chose (from a shoe kit without the origin of the product identified) the Portuguese shoes, based on design, the quality of raw material and the quality of finishing. When the origin of the shoes was revealed, the Portuguese shoes that were identified as the best saw their price decline by 25% compared to the Italian shoes. Portuguese firms produce high quality goods but they do not mark their products as products of Portugal but as products of the EC, as there is a poor image connotation. The same problem applies to the Portuguese mould sector, and this is confirmed by the fact that moulds from Portugal are about 30% cheaper than in other European countries. Being from Portugal makes the mould cheap. The image of Portugal as a country may bias the quality of the mould. However, as suggested by António Rodrigues (see *O Molde*, Nº6, 1989), a good image of the Portuguese mould industry has been built up and is associated not only with competitive prices but also with technical competences. A strong marketing policy should therefore be developed towards the external market, in order to publicise the good image of the Portuguese mould industry as well as the image of the country itself.
- *Financing institutions should provide a variety of financial options for SMEs* in the sector. The research has revealed that different types of firm tend to have different financing problems. Given the need to develop industrial complexes around leading prospector firms, financial institutions need to develop a wider range of financial instruments to meet the borrowing and investment needs of

[1] See *Marketeer*, May, 2002, pp:18-30.

different types of firm. Firms should be able to choose from among several financing alternatives the one that best serves their investment purposes. Better understanding the inter-relationship between business strategy and a firm's financial strategy is an area where this research could be further developed.

- *Active restructuring of the sector*. The research has revealed a complex web of inter-firm relationships and has identified the need for firms to increasingly specialise. These insights should provide the information needed for government or certain key firms to consider restructuring the sector through increased vertical or horizontal integration through the development of firm partnerships.
- As the industry is based on a network of interrelated relationships, all firms in the industry, the Government and sectoral institutions should make efforts to help Defenders to achieve sustainable growth. If not, as they are an important part of the business network, the industrial structure may collapse, with serious implications for everyone.

7.5. The significance of the research results and claims to knowledge

This research has generated important outcomes:

- It reveals many new understandings of how the sector operates, which will be of major importance to national and regional industrial policy makers.
- The particular industrial sector in Portugal had never been the subject of such an in-depth and longitudinal study of strategic behaviour before. The study has yielded a wide range of information and insights, which will be of direct relevance to industrial and regional policy.
- The Miles and Snow's strategic typology was found to be cross-culturally and cross-sectorally applicable and to provide a viable framework for industrial analysis.
- There is a clear hierarchy of strategy types. Prospectors are the market leading type in that they produce moulds of higher added value, lead the markets and the client industries in terms of total sales. They place greater emphasis on

marketing and innovation, invest most, are large firms, have a management capability, offer greater benefits to their customers, are more aware of the location of their competition and what they are doing, lead the subcontracting business relationships and outperform other strategy types in dynamic environments.

- Defenders are important in sustaining the development of the sector but tend to perform less well in dynamic as opposed to stable economic environments. Defenders need and expect government and institutional support to increase their competitiveness.
- The findings corroborate the notion that different environments favour different strategy types and that strategies are not equally viable over time. While some firms have been shown to change strategy type (often to Analyser), there are some that maintained; there is a degree of inertia, which needs to be a focus for industrial policy.
- There is an intertwined network of complex business relationships. The analysis of subcontracting revealed the internal organisation of the industrial sector, the supply chain and the nature of linkages between different firms in the industry. Understanding this complex structure is an important element in underpinning the development of industrial policy. This is an area where this thesis has made a major contribution to knowledge and policy development.
- The dynamic analysis (which has been conducted over a longer period than prior studies) has yielded significant insights. The findings reveal that there were firms that changed their strategy over time and others that maintained it. Firms changed their strategy in order to adapt to the changing environmental conditions. Strategies are not equally viable over time as the environment changes. There was a degree of consistency in a pattern of change of strategies in response to changing environmental conditions. It was also revealed that in dynamic environments Prospectors (*Stayer* Prospectors or firms that moved from Defenders to Prospectors) outperformed other strategy types.
- Significant differences emerge from looking at performance in a static and in a dynamic viewpoint. From a static viewpoint, Defenders in stable environments outperformed the other strategy types, but Prospectors outperformed others in

more dynamic environments. From a dynamic viewpoint the analysis showed that there is no consistent pattern between *Stayers* and *Movers* in stable environments. Different strategy types outperform others in different performance measures. However in dynamic environments Prospectors (either *Stayer* Prospectors or Defenders who became Prospectors) outperformed the other strategy types.

As a direct result of undertaking this in-depth, longitudinal research, it is possible to develop a number of guidelines to assist policy makers in developing industrial policy. The first, very clear point is that industrial policy formulation will be enriched if policy makers spend more time in trying to understand the strategic behaviour of firms and how firms adjust to changed environmental circumstances. By using the Miles and Snow's model, it is clear that there is a direct relationship between the nature of the competitive environment and strategic behaviour. Historically, firms were able to take a defender stance in stable markets but as trading conditions have changed, this pattern of behaviour has become less viable and firms have had to adopt the Analyser or Prospector behavioural pattern if they are to survive and to improve the performance. However, the study has revealed real impediments to firms making this transition. Government policy needs to be focused on relaxing these constraints.

Second, the better understanding of the hierarchy of firms and the complex network that binds these firms together is of direct relevance to policy formulation. Prospectors need to be encouraged to prospect for new markets, though this can only be achieved if the workforce skill problems and the productivity issues facing these firms are overcome. Prospectors are also those firms that are most likely to benefit from government interventions to support innovation and investment in cutting edge technologies. Given the nature of the inter-trading relationships, support for Prospectors can be expected to trickle down, and to indirectly impact upon Analysers, which might then be encouraged to increasingly adopt the characteristics of Prospectors in terms of becoming more aggressive in looking for new sectoral and geographical markets. However, the constraints on Analysers - such as access to capital - might need to be overcome if Analysers are to increase their productivity and

thus enhance competitiveness. Finally, it is clear that Defender firms are not best suited to highly competitive business environments, though many of them do have a niche role to play in the industrial sector. Perhaps these firms should be encouraged to make the transition to Analyser firms in an attempt to get them to leave behind some of the more "redundant" characteristics of Defenders and to move to a more balanced strategy.

7.6. Reflections on the research, the research process

The main aims of the study were to develop a detailed understanding of change in a particular industrial sector, to test the appropriateness of the Miles and Snow typology to that sector and to examine if different levels of performance were achieved in different strategic types. As with all research projects, the detailed implementation of the research forces the researcher to make choices about the selection of methods and the use of data. The purpose of this concluding section of the thesis is to reflect critically on some of the choices that have been made and to identify possible weaknesses in the research, which may have had an effect on the validity and reliability of the results and the conclusions drawn from those results.

Methodology:

Business strategy is an extremely complex phenomenon and there are many variables that account for its development. It is therefore difficult to measure strategy in all its dimensions. One of the difficulties of the current research was the measurement of all possible business strategy variables that may contribute and influence the development of an organisation's business strategy. For example, variables such as the leadership or organisation's culture are important and influence the organisation's business strategy. Nonetheless, they were not included in the questionnaire; top managers did not mention them during the interviews as being among the key competitive factors that sustain competitive advantages. Economic and time constraints prevented the inclusion in the questionnaire of all the possible variables that may affect business strategy. The generalisability of the current research findings was pursued in recognition of this fact.

The dimensions or variables used in the questionnaire do not exhaust the concept of strategy but they do consider many of its important elements. The current research made use of a comprehensive set of strategic dimensions that is believed to portray a great deal of business strategic behaviour.

The problems of getting access to organisations in business and management research are well known and the process of data collection in businesses is often problematic. The approach used here was an intensive approach and the objective was to achieve responses from all the 91 manufacturing firms from the Portuguese mould association database. While responses were achieved from 63 companies, it is difficult to be certain if there was a response bias in that certain types of firms were more or less likely to respond than others. The approach used here was to collect a wide range of data about individual firms in order to develop a holistic view of the companies concerned. A rather more parsimonious approach to data collection may have been advisable.

Longitudinal analysis:

The objective of the study was to explore how strategy had evolved over time and how changes in the environment external to the firm had affected those firms' choice of strategy. Retrospective longitudinal research of this type is difficult in that senior managers were being asked to reflect back over a long period of time and, clearly, their memories have faded or the senior managers of the time may no longer have been working in those businesses. However, reference was made to published sources (such as accounts) where this was possible. The financial data in particular, was all derived from company accounts. Biased reporting from managers about the past strategic positioning taken by firms could have introduced some element of unreliability into the research.

Incorporating time into the analysis:

Clearly, accurate longitudinal research requires time to be appropriately incorporated into the research design. Based on discussions with managers, five time periods were chosen for the analysis (1980-86; 1987-92; 1993-95; 1996 and 1997). The most obvious point is that the 17-year period has not been divided into five equal time periods and, consequently, in the two early periods, managers are being expected to generalise their strategic behaviour over a long period. Given that the research concludes that there is a degree of dynamism in firms' strategic behaviour, then firms may have changed their strategic behaviours within these two early time periods. The unevenness of the time periods may also have introduced error into the research findings.

The data analysis:

The purpose of the research was exploratory (i.e. to identify how firms in the industrial sector had changed their strategy over time in response to changing environmental conditions), focused on testing the applicability of the Miles and Snow typology and focused on trying to identify if different types of firms out-performed others. Throughout, the approach was to test the effect of different measures and associations on a one-by-one basis and little attempt was made to develop more robust, multivariate models. Further analysis of the data would require the development of more advanced models and more rigorous hypothesis testing.

The choice of the Miles and Snow framework:

The Miles and Snow typology was central to the research as it used as the vehicle for explaining the dynamics of strategy. The approach has received criticisms primarily that it is a post hoc descriptive framework, and an approach that does not yield a complete view of the complexity of strategy that has little predictive power. The approach was selected because it does provide a framework that was communicable to managers and a framework that they, as research subjects, could understand. It is a simple and broad categorisation of organisational strategic behaviour. It has been seen as the one that characterises the organisation as a complete system, especially its

strategic orientation, and as a useful tool to analyse the relationships between an organisations and its environment. The typology accounts for variations across organisations and allows the "strategy construct" or the concept of strategy to be operationalised. It is a reasonably accurate conceptualisation of firm's strategic behaviour. A second area where error may have been propagated is in the assignment of individual firms to strategy types by the self-typing paragraph approach. Indeed, the analysis did reveal that some firms "wrongly" categorised themselves and this raises the issue of whether it was better to analyse firms using their self-typing or using categories allocated by the researcher. This is an area where bias may have entered the research process. The rich literature available about the use of the framework also provided a set of research questions that could be tested in the data. While the Miles and Snow approach may have its flaws, it was considered to provide a robust framework for the collection and analysis of data.

The convergence of firms to an optimum strategy:

Implicit in the research objectives is a view that certain strategic stances are better suited to certain business environments. Consequently, it might be expected that firms would tend to change their behaviours and converge to an "optimum" strategy. While some firms have changed their strategic stances, clearly others have not. An area for possible further research would be to explore what the triggers were that caused some forms to change and others not to.

7.7. The value of the research

The research is the first, in-depth study of the Portuguese Mould Industry and can be considered to be valuable to three distinct groups: academics, managers and policy makers dealing with regional and industrial policy

Academic value:

The research has undertaken a major testing of the Miles and Snow typology in a national and industrial setting where it has not been tested before. While many of the findings do conform to the expectations derived from prior research, the project has unearthed new findings particularly regarding the size of strategy types, the dynamics of strategy and by the analysis of organisational performance within the context of the typology. In many prior studies, attention has been focused on a limited set of variables, however, in this case, the objective was to examine a wide range of organisational attributes in the context of the Miles and Snow framework. A major contribution of the study was to take a longitudinal view and to gain some insights into the more dynamic aspects of strategic change within the organisations. The research reveals what different types of firms actually do in terms of the markets and sectors they serve and how this has changed as macro-economic conditions have changed. Of particular importance was the identification of a hierarchic structure to the sector where the relationships between firms are highly complex.

Value to managers:

It is intended that aspects of this research will be published in media that will be accessible to practicing managers and it is seen as important that this research has value in use. While academics tend to codify strategy, managers tend to have a far more intuitive feel for "strategy". However, this research has revealed a number of issues of relevance to managers:

- The analysis of subcontracting has provided useful information about the organisation of the industrial sector, the supply chain and the nature of the linkages between different firms. There is a high interdependency between firms, sustained on the development of their own particular distinctive competencies - business specialisation.
- managers need to be more proactive and reflective in how they view strategy.
- managers also need to develop a more informed view of the basis of competition
- managers need to develop a better understanding of how geographic and sectoral markets are changing

- managers need to understand the impact of decisions about strategic positioning on organisational performance
- managers need to better understand how external changes affects the structure of their firms on several dimensions.

In particular, it is hoped that the publication of this research in practitioner journals will help managers understand the choices they have to make and the possible consequences of those choices on the performance of their businesses.

Value to policy makers:

The Portuguese mould industry is a major contributor to the Portuguese economy in general and to the central region of Portugal in particular. The main contribution of the research here is to provide an understanding of the structure and dynamics of the sector that will enable policy makers to develop more informed and effective industrial and regional policy. The identification of a hierarchy of firms in the sector means that Prospectors, analysers and defenders may need different policy and programme interventions to assist them to develop. The fact that the research has incorporated a wide range of issues (such as innovation, technology, skills and marketing) means that it is possible to use the data set to test questions about what forms of interventions are likely to me most effective for different types of firms. The research has also revealed that as firms have changed their geographic and sector markets they have also changed their basis of competition, which in turn will affect the design, and implementation of industrial policy.

7.8. Future research

Further studies should test the applicability of the current research model in different mould makers' environmental settings, i.e. America, Europe or Asia. They should test the applicability of Miles and Snow's strategic typology, the dynamics of strategy and the overall interrelationships with organisational performance using the current research survey instrument. This will show whether the inconsistencies found in the

theory regarding the firm size of strategy types are a result or not of the particular characteristics of the Portuguese mould industry.

The current research could be further extended by the development of an in-depth study of the industry's customers and competition. The analysis of the mould industry's customers (i.e. mainly the plastic manufacturers), their expectations, preferences and strategic behaviour, as well as the understanding of competition (other mould makers around the world), their strategic behaviour, their concerns and how they see the future, will give significant insights into business strategy in its strategic orientation.

According to macro and micro economic indicators, 2000 and 2001 were economically bad years (especially in the second half of 2001). Firms are going through another international economic recession, which seems to repeat itself every 10 years (the cycle is repeating itself again as it did ten years ago in 1990 and 1991). The American economic crisis impacts on the European economy, and consequently on the Portuguese mould makers (the American market is their second most important). Currently some Portuguese mould firms have downsized as a result of slowdown in the American economy. Further research is therefore important in order to analyse firms' strategic behaviour from 1997 to 2002 and it will shed light on how firms are responding to significant environmental changes. These results may reveal that within a time-cycle of 10 years there is an economic recession. Firms and governments should therefore attempt to devise policies to anticipate and minimise its negative effects and define appropriate business strategy for future anticipated environments.

Appendices

Appendix 1

The Literature Review

Appendix 1A - Sun Tzu, the military perspective of strategy

Sun Tzu believed that the perfect strategy in war defeats the enemy without the need for combat, by surprise, by using spies, by limiting the enemy's actions and by stealthy movements. As he said, "the supreme act of war is to subdue the enemy without fighting (p:7)…to plan secretly, to move surreptitiously, to foil the enemy's intention and bulk his schemes, so that at last the day may be won without shedding a drop of blood (p:29)" In this sense strategy is seen as a stratagem to subvert competition. Similarities in business can be established with Mintzberg's (1987) definition of strategy as a *Ploy*. A Ploy strategy is a plan of actions that reduces the competitor's power for growth; limits their action whether by attack or defence, threat or outwits them, (see also Schelling, 1980).

Sun Tzu identified 5 constant incumbent war rules (see Table 1A1) that he called: (1) The Moral of law, (1) Heaven, (1) Earth, (4) The Commander and the (5) Method and discipline. The first, three factors of the art of war imply dedication, loyalty and complete devotion of the individual to the cause. Total commitment of the soldiers to their role, whenever, whatever, and forever. In business strategy those concepts are equally important. Corporate culture, communication, participation, and motivation ensure employees in organisations. However different from the war context, in the business environment there is no contract for life. The environment is far too changeable to secure such a position. People work by projects.

The fourth Sun Tzu war rule is the commander. As mentioned before, the commander should have the character to guide the army in war. In business strategy the organisational leader should have the ability to define the organisation's direction. The organisation's leader is expected perspicacity, vision, prudence, intelligence, initiative, willingness to take risks, authority, amongst other factors. Absence of a commander in war or a top manager in the organisation is like a ship without a captain lost at sea.

The last Sun Tzu war rule is method and discipline. He reveals the importance of the units in the army, the provision of the essential goods and the costs control. Extending the analogy to

business strategy, attention is given to organisation's hierarchy, structure, logistics, and expenses control. The current study highlights the importance of these strategic factors in strategy development.

Table 1A1 - Sun Tzu identified 5 constant incumbent war rules

The Moral of Law, Heaven, Earth, The Commander and the Method and discipline.
(1) The Moral Law - "causes the people to be in complete accord with their ruler, so that they will follow him regardless of their lives, undismayed by any danger".
(2) Heaven - "signifies night and day, cold and heat, times and seasons"
(3) Earth - "comprises distances, great and small; danger and security; open ground and narrow passes; the chances of live and death";
(4) The Commander - "stands for the virtues of wisdom, sincerity, benevolence, courage and strictness".
(5) Method and Discipline -"are to be understood the marshalling of the army in its proper subdivisions, the gradations of rank among the officers, the maintenance of roads by which supplies may reach the army, and the control of military expenditure."

In addition to the five constant factors by which the art of war is governed, Sun Tzu distinguished five key elements for victory (see Table 1A2), which also deserve attention. In his first element he stresses wisdom and awareness. Whether in the military or business perspective, the damage caused by being in the wrong war, at the wrong time, with the wrong enemy is too high. It is important to have the capability for discernment in terms of what fight we want to get involved in, and which fight we want to evade. Sun Tzu (490BC: 16) states: "he will win who knows when to fight and when not to fight.... if he can fight, he advances and takes the offensive; if he cannot fight, he retreats and remains on the defensive. He will invariably conquer who knows whether it is right to take the offensive or the defensive." In business strategy it is so important to choose what we want to do, as it is to decide what we do not want to do. As Porter (1996:70) said "the

essence of strategy is choosing what *not* to do." The sense of opportunity to get into a business is as useful as it is to decide to withdraw from it.

Sun Tzu's second, third, fourth and fifth elements of victory emphasises the ability to allocate resources to best advantage, the sense of opportunity and time, motivation, surprise, and strength. These factors are also very important for business strategy development.

Table 1A2 - Sun Tzu distinguished five key elements for victory.

(1)"he will win who knows when to fight and when not to fight. .." if he can fight, he advances and takes the offensive; if he cannot fight, he retreats and remains on the defensive. He will invariably conquer who knows whether it is right to take the offensive or the defensive."
(1)"He will win who knows how to handle both superior and inferior forces.,...,"it is possible with lesser force to defeat a greater, and vice-versa. The secret lies in any eye for locality, and in not letting the right moment slip."
(3)"he will win whose army is animated by the same spirit throughout all its ranks".
(4) "he will win who, prepared himself, waits to take the enemy unprepared".
(5) "he will win who has military capacity and is not interfered with by the sovereign."

More recently, the described military strategic principles have been applied in the Second World War. Matloff and Snell (1951) planned for large-scale coalitions, moved secretly to develop intelligence networks (Stevenson, 1976). George Marshall denoted the power of an Allied force: concentrated overwhelming forces; refocused allied forces; sequentially co-ordinated movements to face the enemy. von Newmann and Morgenstern (1944) saw strategy as a plan of actions that foresees future environmental events and advances solutions accordingly. As they asserted (1944:79) strategy is a "complete plan: a plan which specifies what choices will be made in every possible situation." As seen, strategy has its origins in the military context.

Appendix 1B - Military perspective of strategy – Quotations

Strategy:

"an economy of force coupled with overwhelming strength at the decisive point; the close co-ordination between units; meticulous staff planning combined with speed of attack; and that the quickest and most economical way of winning a decision is to defeat the competition not at his weakest but his strongest point".

Philip of Macedonian and his son Alexander the Great

Table 1B1 - military principles of strategy

War strategy, military principles
Leadership
✓ "everything achieved by a commander, be it characterised by foresight, advantage, enterprise, or resolution".
Frontinus (first century AD)
✓ "a commander must be ingenious, energetic, careful, full of stamina and presence of mind, loving and tough, straightforward and crafty, alert and deceptive, ready to gamble everything and wishing to have everything, generous and greedy, trusting and suspicious".
Xenophon
✓ "The Commander- stands for the virtues of wisdom, sincerity, benevolence, courage and strictness".
✓ "When the general is weak and without authority; when his orders are not clear and distinct; when there are no fixed duties assigned to officers and men, and the ranks are formed in a slovenly haphazard manner, the result is utter *disorganisation*".
Sun Tzu, (490BC)
Assessing resources
✓ "select resources to best advantages".
Aineias the Tactician (mid-fourth century BC)
✓ "ability to pick out the right men and to utilise combined energy".
✓ "Great results can thus be achieved with small forces".
Sun Tzu, (490BC)
Risk - Costs

✓ "limit risk while holding fast to essential points and principles".

Pericles date

✓ "nothing is to be achieved in war unless you are willing to take risks".

✓ "Who wishes to fight must first count the cost".

✓ "There is no instance of a country having benefited from prolonged warfare",...,"Only one who knows the disastrous effects of a long war can realise the supreme importance of rapidity in bringing it to a close".

Sun Tzu, (490BC)

Assessing competition

✓ "Know your enemy, know yourself and you can fight a hundred battles without disaster".

✓ "If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle".

✓ "Knowing the enemy enables you to take the offensive, knowing yourself enables you to stand on the defensive. Attack is the secret of defence; defence is the planning of an attack".

✓ "the places that I shall attack are precisely those that the enemy cannot defend….the places that I shall hold are precisely those that the enemy cannot attack".

✓ "While the main laws of strategy can be stated clearly enough for the benefit of all and sundry, you must be guided by the actions of the enemy in attempting to secure a favourable position in actual warfare".,...,"To secure ourselves against defeat lies in our own hands, but the opportunity of defeating the enemy is provided by the enemy himself".

✓ "if equally matched, we can offer battle; …if slightly inferior in numbers, we can avoid the enemy; if quite unequal in every way, we can flee from him".

✓ "Force him to reveal himself, so as to find out his vulnerable spots".

✓ "carefully compare the opposing army with your own, so that may know where strength is superabundant and where it is deficient".,..., "So in war, the way is to avoid what is strong and to strike at what is weak".

✓ "if we wish to wrest an advantage from the enemy, we must not fix our minds on that alone, but allow for the possibility of the enemy also doing some harm to us, and let this enter as a factor into our calculations."

✓ "the natural formation of the country is the soldier's best ally; but a power of estimating the

adversary, of controlling the forces of victory, and of shrewdly calculating difficulties, dangers and distances, constitutes the test of great general."

✓ "there are roads which must not be followed, armies which must not be attacked, towns which must not be besieged".

✓ "The city is small and well-fortified",…, "it is a great mistake to waste men in taking a town when the same expenditure of soldiers will gain a province".

✓ "The wise man considers well both advantage and disadvantage".

✓ "Move unless you see an advantage; use not your troops unless there is something to be gained; fight not unless the position is critical".

✓ "If it is to your advantage, make a forward move, if not, stay here you are".

Sun Tzu, (490BC)

Secrecy

✓ "ensure secrecy".

✓ "O divine art of subtlety and secrecy".

✓ "by discovering the enemy's disposition and remaining invisible ourselves, we can keep our forces concentrated, while the enemy's must be divided".

✓ "the spot where we intend to fight must not be made known".

✓ "All men can see the tactics whereby I conquer, but what none can see is the strategy out of which victory is evolved."

Sun Tzu, (490BC)

Time - Opportunity

✓ "the value of time-that is, being a little ahead of you opponent-has counted for more than either numerical superiority or the nicest calculations with regard to commissariat".

✓ "Those who want to make sure of succeeding in their battles and assaults must seize the favourable moments when they come and not shrink on occasion from heroic measures".

✓ "he will win who knows when to fight and when not to fight. .." if he can fight, he advances and takes the offensive; if he cannot fight, he retreats and remains on the defensive. he will invariably conquer who knows whether it is right to take the offensive or the defensive."

Sun Tzu, (490BC)

Surprise – Rapidity

✓ "fearing a surprise attack".

✓ "astonishing rapidity,…before the enemy had got win of his movements".

✓ "… na attack should be made so quickly that it cannot be parried".

✓ "Rapidity is the essence of war. Take advantage of the enemy's unreadiness, make your way by unexpected routes, and attack unguarded spot".

Sun Tzu, (490BC)

Deceive the enemy

✓ "all the warfare is based on deception".

✓ "Hence, when able to attack, we must seem unable; when using our forces, we must seem inactive; when we are near, we must make the enemy believe we are far away; when far away, he must make him believe we are near".

✓ "thus one who is skilful at keeping the enemy on the move maintains deceitful appearances, according to which the enemy will act".

✓ "he will conquer who has learnt the artifice of deviation. Such is the art of manoeuvring".

✓ "to make him believe that there is a road to safety".

✓ "is nothing more nor less than the timely use of "bluff".

✓ "Thus the highest form of generalship is to baulk the enemy's plans; the next best is to prevent the junction of the enemy's forces".

Sun Tzu, (490BC)

Keep Changing - Innovating

✓ "understands the advantages that company variation of tactics,…" the forecastle strategy, is a strategy to be attacked by competitor or anticipated by him,...,the art of varying plans".

✓ "Keep your army continually on the move, and devise unfathomable plans."

✓ "Therefore, just as water retains no constant shape, so in warfare there are no constant conditions".

✓ "The general who thoroughly understands the advantages that accompany variation tactics knows how to handle his troops".

✓ "By altering his arrangements and changing his plans, he keeps the enemy without definite knowledge. By shifting his camp and taking circuitous routes, he prevents the enemy from anticipating his purpose".

✓ "Discard hard and fast rules. Victory is the only thing that matters, and this cannot be

achieved by adhering to conventional canons."

Sun Tzu, (490BC)

People - Knowledge

✓ "He knows these things, and in fighting puts his knowledge into practice, will win his battles."

✓ "Thus, what enables the wise sovereign and the good general to strike and conquer, and achieve things beyond the reach of ordinary men, is *foreknowledge*.",..., " That is, knowledge of the enemy's dispositions, and what he means to do".

Sun Tzu, (490BC)

Motivation

✓ "analyse social forces and structures as a basis for understanding effective commands styles and motivational stimuli".

Von Clausewitz, (1976:8)

Integrative and Interactive Army: co-operation and unity

✓ "You will not succeed unless your men have tenacity and unity of purpose, and, above all, a spirit of sympathetic co-operation.""

✓ "I would inspire my men with unity of purpose…., I would see that there is close connection between all parts of my army."

Sun Tzu, (490BC)

People Control - Rewards

✓ "The warlike prince controls his soldiers by his authority, knits them together by good faith, and by rewards makes them serviceable. If faith decays, there will be disruption; if rewards are deficient, commands will not be respected.""

✓ "Therefore soldiers must be treated in the first instance with humanity, but kept under control by means of iron discipline."

✓ "profession of arms requires a combination of hardness and tenderness., …., The art of giving orders is not to try rectify the minor blunders and not to be swayed by petty doubts".

✓ "Rewards are necessary in order to make the soldiers see the advantage of beating the enemy; thus, when you capture spoils from the enemy, they must be used as a rewards, so that all your men may have a keen desire to fight, each on his own account".

Sun Tzu, (490BC)

Logistics - Suppliers

✓ "The secret of war lies in communications. The line of supply may be said to be as vital to the existence of an army as the heart to life of a human being".

✓ "I would try to ensure a continuous stream of supplies".

Sun Tzu, (490BC)

Alliances

✓ "The host thus forming a single united body, it is impossible either for the brave to advance alone, or for the cowardly to retreat alone".

✓ "join hands with your allies. Do not linger in dangerously isolated positions".

✓ "On ground of intersecting highways, I would consolidate my alliances".

Sun Tzu, (490BC)

Generate or sustains competitive advantages

✓ "Move only if there is a real advantage to be gained."

✓ "The difficulty of tactical manoeuvring consists in turning the devious into the direct, and misfortune into gain."

✓ "concentrate your energy and hoard your strength."

Sun Tzu, (490BC)

Appendix 1C - Strategic similarities between the military and the business perspectives.

Table 1C1 - Strategic similarities between the military and the business perspectives.

Key words	Military strategy perspective	Business strategy perspective
Leadership, knowledge	Commander	Top manager, organisation's leader
Assessing resources	Deploy available resources to best advantage Evaluation of theirs and the opponent's strengths and weaknesses	Resource-based theory SWOT analysis, amongst other strategic analysis.
Plan; pattern; ploy	formulating a meticulous plan of actions and deceptive manoeuvres	strategy as a plan; strategy as a pattern; strategy as a stratagem.
Time - opportunity	Move fast to essential points and principles	Move before your competitors
Risk	Limit the risk	Feasible risk
Logistics	Developing full logistics to guarantee supply to the army	Developing full logistics to secure organisational operationalisation
Information	Misleading messages, make the enemy believe	Builds organisation's competitive advantage
Alliances	Concentrated overwhelming forces against the foe	Collaborative advantage towards the creation of the organisation's value.
Unique competitive advantage	Aligning forces into a unique position to secure distinctive advantage	Differentiation. Uniqueness. Difficult to copy by counterparts
Communication-information shared, co-operation	Throughout the army. Not negotiable	Throughout the employees in the organisation, involving participation, sharing, and learning.
Motivation, participation, commitment, training, rewards	Soldiers, commitment for life	Employees, commitment for projects.
Interactive system, co-ordination	In close co-ordination with all units, the unified army	Co-ordination of all departments/division/employees
Control	Well disciplined troops	Control of employees and organisation's results
Costs	Low costs	Efficiency
Change	Counterattack re-thinking	Strategy re-design – continuous learning

Appendix 1D - Strategy concept evolution over the years

Strategy concept - evolution over the years: in the 60s-70s, 80s, and in the 90s

Business Strategy in the 1960s and in the 1970s

In the 1960s-1970s, business strategy was synonymous with strategic planning. Strategic planning became popular in the late 1960s, namely under the influence of the Boston Consulting Group; the McKinsey and Company, and the Strategic Planning Institute. Strategic planning was associated with corporate plan, (see Ansoff, 1965, Anthony, 1965) a rational systematic process that could be developed like a science. Strategy was formulated according to a precise sequence: objectives were set and solutions determined. Strategic planners were experts in strategic analysis of hard data, e.g. formulae, flowcharts and matrices (see Grant 1991a), strategic planning functions, and the development of planning processes for corporate and business units. Plans involved massive data and bureaucratic forms to fill in (outlines, bullets, schedules, and balance sheets). Formal plans were followed by strict budget control, by firms' expectations of the economic growth, and the development of the organisations' markets. Corporate planners emphasised markets and products towards achieving a macroeconomic environment in order to forecast their growth. Strategic planning was used as a tool to foresee the future (see Argenti, 1968,1980, and Ackoff, 1970).

Strategic planning techniques such as product life cycle (see Levitt, 1965; and Rink and Swan, 1979) the experience curve (see BCG, 1968, 1972; and Yelle, 1979)**,** and the BCG growth-share matrix (see Day, 1977; and Hedley, 1977), gained significance in structuring the information to evaluate markets and demand. Strategy was seen as the choice of markets and products positions.

The Boston Consulting Group (led by Bruce Henderson in 1971) drove the strategic thinking. Any business should fit in one of the four quadrants of the BCG matrix, according to its market growth rate and its relative market share. Strategy formulation emphasised growth, and business

diversification and vertical integration (see, Rumelt, 1982, 1986; Prahalad and Bettis 1986; and Slater and Weinhold, 1979) was a mean to achieve it.

Strategy was number driven, emphasising a cost-economist perspective (see von Newmann and Morgenstern, 1944, and Schoeffler, Buzzell and Heany, 1974). Schoeffler, Buzzell and Heany, (1974) have studied the impact of strategic planning on profit performance. They developed a profit model, starting with General Electric - The Profit Impact of Market Strategies – PIMS, to forecast profit performance in the business units). Superior corporate performance was achieved through those of economics. The objectives of the firm were focused on profit maximisation. Alfred Sloan (1963:49), former president of General Motors, defended that "the strategic aim of business is to earn a return on capital, and if in any particular case the return in long run is not satisfactory, the deficiency should be corrected or the activity abandoned".

Organisations were privileged rather than individuals, and were understood as efficient devices. People were replaced for making the slightest mistake. Functions became routine-based and decision-making was centralised in the all-powerful top executive (Hollis and Nell, 1975). Managerial style meant vertical command and control systems. The *New Republic* magazine describes the professional manager of the time:

> "He plans, organises and controls large enterprises in a calm, logical, dispassionate and decisive manner. The symbols in which he thinks and works are those of finance, law, accounting and psychology. Finessed and massaged into ever new formulations they yield wondrous abstractions. And because the professional manager deals in abstractions, he can move from company to company with relative ease, manipulating people and capital as he goes. Without any abiding commitment to the company, he is the master of the quick fix, yielding the sort of short term profits that institutional investors love"
>
> *(In Leavy 1996, Kotler 1981:111)*

Business Strategy in the 1980s

In the 1980s strategy is seen less as the selection of markets and products positions, and emphasis is given to core business (Peters and Waterman, 1982), and competitiveness (Porter, 1980). Michael Porter's (1980, 1985,1990) strategic analysis tools tailored strategy formulation. With his

industry competitive analysis developments (the five-force model, the generic strategies, the value chain, and the diamond), he was the major influence in the 1980s.

Strategic change and renewal also gained a dynamic impulse in the 1980s (see Quinn, 1980, Kanter, 1983, Pettigrew, 1985, 1987, 1988). A need for organisational strategic change is recognised. American businesses were threatened by Japanese competition, (see Pascale 1984, Pascale and Athos, 1981; Ohmae, 1982; and Rumelt, 1980) especially in the consumer electronics, automobile and in the motorcycle industry. Quality was the key factor pointed at for Japanese success, and in the late 1980s "Total Quality Management" became intensively studied (Kay, 1995).

In the 80s, global competition also became a business buzzword and all respected firms had a global strategy to conquer international markets (Levitt, 1983, and Prahalad and Hamel, 1985). Organisation's strategy concern was the shareholder value rather than only profit maximisation (Rappaport, 1986).

Business strategy in the 1990s

In the 1990s strategy formulation is an art, where knowledge, creativity, imagination and intuition are important key elements. Creativity is boosted by information technology, knowledgeable workers and horizontal co-ordination. Horizontal and flat communication systems facilitate the diffusion of ideas and encourage added knowledge. Strategy formulation rather than being centralised in the organisations' top leaders, characteristic of the 1960s-1970s, is a result of an active participation of each single individual and their expertise. Strategy is about articulation, communication, shared information, experience, and learning.

In the 1990s, new environmental factors such as technological developments, increasing globalisation of competition, social and political events turned strategy into an integrated and interactive system of creativity between the organisation and its external environment. Therefore, a close management relationship with all parts involved in the creation of the organisation added

value, i.e. employees, customers, competitors, and suppliers is emphasised. Related to employees the appropriate organisational culture favour organisational knowledge. Motivation, commitment, participation, communication, and rewards are the key elements of that process. Related to customers, there is an increasing organisational concern with obtaining customers' satisfaction. Customer feedback of the organisation's products and/or services helps the organisation to improve and consequently to increase customers' added value. Related to suppliers, the supply chain was completely re-designed. Organisations reduced their suppliers to just a few companies, but expected total commitment from them. Suppliers are invited to be an integrated part of the organisation outputs. Jack Welsh asserted: "In a boundaryless company, suppliers aren't outside. They are drawn closer and become trusted partners in the total business process...in a boundaryless company, internal functions begin to blur", *General Electric annual report, 1990*

Approaches to strategy

According to Whittington (1993), there are four approaches to strategy, i.e. the classical, the evolutionary, the processual and the systemic approach.

The classical approach

Strategy within the classical approach is rational, planned and economically effective. Analytical strategists follow a sequential, scientific approach towards profit maximisation. The classical approach to strategy coincides with the period 60s-70s.

The evolutionary approach – population ecology

This approach understands that strategic competition will be subject of a natural selection process (efficiency) in which only the best organisations will survive and the weaker performers will be eliminated. Efficiency can be achieved by a continued stream of new entrants into any organisational population, from which, the poorly adapted to the environment are simple withdrawn. Rates of new entrants and failures are an indication of economic strength and

dynamism (Hannan and Freeman 1977, 1984). As suggested by Henderson (1989), competition is a matter of continuous fight for survival in an excessive populated environment. Henderson (1989) supports the biological and ecological principles of natural selection, 'principle of competitive exclusion'. For a given market there will be firms that perform and survive while others will be eroded from the ecological system. The approach emphasises the limit capacity of organisations to anticipate and respond deliberately to environmental shifts. Conversely to the classical approach, the evolutionary approach understands that environmental changes are too unpredictable to be able to define strategy rationally. Is the market that judges the course of direction of organisations and allows them to achieve or not profit-maximisation. Organisations are ruled by environmental market forces. The environment does the selection of the best strategy rather than managers. As suggested by Hannan and Freeman (1977, 1984) the selection processes favours organisations with relatively inert structures, operating in relatively stable environments. Nonetheless, Penrose (1952) criticises the evolutionary perspective. As he suggests there may be firms that dominate, control the markets against competitive pressures, and therefore, strategy is more about selecting markets rather than being selected by markets.

Concluding according to this perspective, strategy is efficient, aims to survive, is focused on external markets, is developed under the Darwinian theory, and is influenced by economists and biologists.

Processual approach

For this approach, strategy emerges step by step in a complex and dynamic organisational and market context. Strategy emerges in action. Processualists are incredulous to either the rationality point of view of strategy defended by the classical approach or to efficiency of the markets selection in driving strategy of the evolutionary approach. Rather they defend that strategy is influenced by the individual's personality (psychology - internal politics and cognitions). For the processual approach, strategy is a result of a political compromise between the organisational members and the organisational aims (Cyert and March, 1963, Pettigrew, 1977, 1985). Strategy is crafted under the influence of individual touch, imperfections, and creativity, in a process of

constant adaptation (Mintzberg, 1987). According to Mintzberg, crafting strategy is a continuous and adaptive process, in which formation and implementation are inextricably entwined. This gradual adaptive approach is set in a logical incrementalism (Quinn, 1980), rooted in a process of experimentation and learning. Strategy emerges as consecutive small actions that eventually amalgamate into a pattern.

Whittington (1993) has perceived the resource-based theory as a processual approach to strategy, as it results in a long-term construction and consolidation of distinctive internal competences. In this context, strategy is more an inner process than the choice of external markets-products opportunities. The processual approach emphasises the development of distinctive competences through incremental adaptation (based on learning and experience) and strategy implementation towards performance maximisation. However the current research has categorised the resource based theory as a development of the 90s and therefore as interpreted within the organisational knowledge perspective.

In conclusion, strategy within the Processual approach is crafted, woolly, focused on internal politics and cognitions, developed under the learning and experienced premises, and influenced by psychologists. Strategy is interpretative.

The systemic approach

Organisations are embedded in different social, cultural and economic systems. The systemic approach emphasises social systems and the way they shape and affect strategy development, the way cultures of particular societies and organisations delineate strategy formation. The others approaches have been neglecting the social, cultural and political factors on the definition of the organisational strategy. For the systemic perspective the way strategy is developed relies on the managers' social characteristics and the social context in which their organisations operate. As suggest by Whittington (1993:39), 'the main message of the Systemic perspective is that strategy must be sociologically sensitive". Managers should analyse the social environment in which their

organisations are embedded in order to craft their strategy for best advantage. According to Whittington (1993), this approach to strategy characterises the 90s.

Concluding, the systemic theorists defend that strategy is a reflection of the social environmental contexts (external societies) in which managers and organisations are embedded; strategy is influenced by sociologists.

The current research diverge in some points of the Whittington's (1993) approaches to strategy, namely in the 80s and in the 90s. Whittington (1993) defends that Porter's (1980) product and market positioning concerns fit in the classical approach. However, the current research besides recognising some similarities to the classical approach, considers that strategy in the 80s is more than that. Strategy is also core business, renewal and change, and total quality management, towards the achievement of organisational competitiveness. Therefore it seems reasonable to distinguish an approach to strategy and name it competitiveness-focused perspective. Related to the 90s, strategy is more than the result of the social characteristics of the strategists and the context in which they operate. Strategy is the creation of organisational knowledge. Knowledge-based organisations characterises organisational strategy of the 90s, constituting an approach to strategy.

The above-mentioned evolution of the strategy concept over the years could be summarised into two broaden schools of thoughts: strategy as an instrumentalist-rationalist view (Ansoff, 1991, 1994), which characterises the 1960s-70s, and strategy as an interpretative view (Mintzberg 1990, 1991, 1994), that identifies the 1980s-90s.

Appendix 1E - Strategy concept – the most prominent contributors

Several are the researchers that have described strategy. Table 1Ea presents the most prominent authors' strategy interpretations. Key words were printed in bold to facilitate the identification of Common or differences points among the concepts.

Table 1Ea – Strategy concept – the most prominent contributors: common and different elements

Author, year	*Definition of the strategy concept; strategy is:*
Chandler (1962)	"the determination of the **basic long-term goals** and **objectives** of an enterprise, and the **adoption of courses of action** and the **allocation of resources** necessary for **carrying out these goals**." p:13
Miles and Snow (1978)	"Strategy is a ***pattern* or a *stream*** of major and minor **decisions** about an organisation's possible **future domains**." p:7
Hofer and Schendel (1978) Schendel and Hofer (1979)	"strategy has been defined as "**the match** an organisation makes **between its internal resources** and skills…and the **opportunities and risks** created by its **external environment**" p:12 "Strategy is a **pattern or stream of decisions** taken to achieve the most favourable **match between external environment and organisation**. Strategy is defined in four elements: (1) scope, described in terms of **product/market** matches and geographic territories (1) **resource** deployments and **distinctive competences**, (1) **competitive advantages**, and (4) **synergy". p:**
Andrews (1980)	"Corporate strategy is the **pattern of decisions** in a company that determines and reveals its **objectives, purposes, or goals**, produces the **principal policies** and **plans** for **achieving those goals**, and **defines the range of business** the company **is to pursue**, the kind of **economic and human** organisation it is or intends to be, and the nature of the **economic and non-economic contribution** it intends to make to its **shareholders, employees, customers, and communities**." p:18; "The strategic decision contributing to this pattern is one that is **effective over long periods of time,** affect the company in many different ways, and focuses and commits a significant portion of its **resources** to the expected outcomes. The **pattern resulting** from a series of such decisions will probably **define the** central **character and image of a company,** the individuality it has for its members and various publics, and the **position** it will occupy in its **industry and markets**", p:19 "The **interdependence** of **purposes, policies**, and organised **action** is crucial to the particularity of an individual strategy and its **opportunity** to identify **competitive advantage**. It is the **unity**, **coherence**, and internal **consistency** of a company's strategic decision that **position** the company in its **environment** and give the firm its **identity**, its power to mobilise **strengths**, and its likelihood of success in the marketplace". p:10; "**the product line and services offered** or planned by the company, **the markets and market segments** for which products and services are now, or will be designed, and the **channels through which these markets will be reached**. The **means** by which the operations is to be **financed** will be specified, as will the **profit objectives** and the emphasis to be placed on the **safety of capital versus level of return"**.p:11. "On the basis of your **experience**, you may deduce from decisions observed what the pattern is and what the **company's goals and policies are**,....careful **examination of the behaviour of competitors** will reveal what their strategy must be. ..... Strategists who do not **look beyond**

	present behaviour to **the future** are vulnerable to surprise". p:14; " the principal subactivities of strategy formulation as a logical activity include **identify opportunities and threats in the company's environment** and attaching some **estimate or risk** to the discernible alternatives. Before a choice can be made, **the company's strengths and weaknesses should be appraised together with the resources** on hand and available. Its actual or potential capacity to take advantage of **perceived market needs** or to cope with attendant risks should be estimated as objectively as possible". p:15
Porter (1980)	"a combination of the ***ends*** (goals – definition of **how the business is going to compete**) for which the firm is striving and the ***means*** (policies – target markets, product line, financial control, R&D, purchasing, labour, manufacturing, distribution, sales, marketing) by which it is **seeking to get there**"; p:xvi Competitive strategy formulation comprises four key factors that confine the organisation' ends: (1) Company strengths and weaknesses; (1) Personal values of the key implementers; (1) broader societal expectations; and (4) Industry opportunities and threats (economical and technical). p:xviii "Competitive strategy examines the way in which a firm can compete more effectively to strengthen **its market position**." p:x
Quinn (1980)	"strategy is the **pattern or plan** that **integrates** an organisation's major **goals, policies**, and **action** sequences into a **cohesive whole**. A well-formulated strategy helps to marshal and **allocate** an organisation's **resources** into a **unique** and viable posture based on its relative **internal competences** and shortcomings, **anticipated changes in the environment**, and contingent moves by intelligent opponents**."** (p:3)
Rumelt (1986)	Strategy "is creating situations for **economic rents** and finding ways to sustain them, that is, any viable **position**, whether or not competitive" p:
Galbraith and Schendel (1983)	As they advocated "strategies represent a **network of interactions among** the **various constituent elements** that ultimately make a business strategy. **Interrelationships** in strategy sub-components imply that intra-firm variations in one variable will be in concert with variations in other strategy variables." p:155
Pascale (1984)	"process by which a firm searches and analyses its **environment** and **resources** in order to **select opportunities** defined in terms of **markets to be served and products** to serve them, and make discrete decisions to invest **resources** in order to **achieve** identified **objectives**, p:80 "**all the things** necessary for the **successful functioning** of organisation as an **adaptive mechanism**"p:90.
Mintzberg (1987)	As Mintzberg describes, strategy in 5Ps, as: (1) a **Plan**, is "some sort of consciously intended course of action, a **guideline** (or a set of guidelines) to deal with a situation", p:11 (1) a **Ploy**, is "a plan of action that reduces the competitors' power or growth, limits their action, threatens or outwits them**. Is a stratagem that subverts competition**", p:11 (1) a **Pattern**, "a pattern in a stream of actions. A pattern strategy focuses on action, **sets convergence**, and **consistency** in the organisational behaviour", p:11 (4) a **Position** is the "match between the organisation and [its] environment, that is between the internal and external context". p:15. (5) a **Perspective**, " It looks inside the organisation, indeed inside the heads of the collective strategist…its content consisting not just of a chosen position, but of an ingrained way of perceiving the world." p:16; "Strategy is a perspective shared by the members of an organisation. *Collective mind-individuals* united by common thinking and or/behaviour." p:17 Strategy interrelates the 5 Ps
Hax (1990)	"embraces all the critical activities of the firm, provides a sense of **unity**, **direction and purpose**, as well as facilitating the necessary **changes** induced by a firm **environment**".

	Hax identifies **six** critical dimensions of the strategy concept, which as he states must be included in any unified definition: (1)Strategy as a **coherent**, **unifying** and **integrative pattern of decisions**; (1) Strategy as a **means** of establishing an organisation's **purpose** in term of its **long-term objectives, actions programs**; 1 - Strategy as a definition of a firm's **competitive domain**. 4 - Strategy as **a response to external opportunities and threats and to internal strengths and weakness as a means of achieving competitive advantage**. 5 - Strategy as a logical **system** for **differentiating** managerial tasks at **corporate**, **business, and functional levels**. 6 - Strategy as a definition of the **economic and non-economic contribution** the firm intends to make to its **stakeholders**" p: 14-16
Kay (1995)	"the strategy of the firm is the **match between its internal capabilities and its external relationships**. It describes how it responds to its suppliers, its customers, its competitors, and the social and economic environment within which it operates. The analysis of strategy uses our **experience of the past** to develop concepts, tools, data, and models which will illuminate these **decisions** in the **future**." p: 4
Johnson and Scholes (1993)	" strategy is the **direction and scope** of an organisation over the **long term**: ideally, which **matches** its **resources** to **its changing environment,** and in particular its **markets**, **customers** or clients so as to **meet stakeholder expectations**" p:10
Thompson (1995)	"strategies are **means to ends**, and these ends concern the purpose and objectives of the organisation. They are the **things that business** do, the paths they follow, and the **decisions** they take, in order to reach certain points and levels of success." p:7
Porter (1996)	"Competitive strategy is about being **different**...a different **set of activities to deliver a unique mix of value**...strategy rests on **unique activities**" (1996:64); As Porter stated " a company can outperform rivals only if it can establish a **difference that it can preserve**" (1996:61). "strategy is about ***combining*** **activities**", p:70; "strategy is creating **fit** among a company's activities" p:75 for a "**unique competitive position**" p:78.

Appendix 1F - Customers

Tom Peters (1987) presented the concept of "total customer's responsiveness". In order to accomplish it, organisations should: (1) Specialise, create market niches and differentiate. (2) Provide top quality, as it is perceived by the targeted customers. (3) Offer superior services that will be difficult to be imitated (see also Mintzberg, 1989 and Kay, 1995). (4) Establish a close and collaborative relationship with customers. (5) Go overseas. (6) Create uniqueness (see also Mintzberg, 1989 and Porter, 1996). (7) Listen to your customers systematically; (8) Turn manufacturing into a marketing weapon – create an interaction team of all the functional employees departments, customers and suppliers; be flexible. (9) Make sales and service forces heroes, provide training, let them participate, listen to them, and reward them. Pursue fast-paced innovation - do it all fast, and (10) Launch a customer revolution – become customer obsessed, direct actions according to customer's wishes, and take advantage of any opportunity to achieve it.

Appendix 1G - The Dynamics of Strategy and Strategic Change

Appendix 1G1 - Ambixetrous organisations,

Ambixetrous organisations are those that can manage and pursue both, incremental and discontinuous change, by having contradictory structures, processes, and cultures within the same firm (Tushman, and O'Reilly III, 1996). The end result is that ambidextrous organisations learn by the same mechanisms that sometimes destroy successful firms: variation, selection, and retention. They promote variation through strong efforts to decentralize, to eliminate bureaucracy, to encourage individual autonomy and accountability, and to experiment and take risks. This promotes wide variation in products, technologies and markets. These firms stay close to customers and are able to respond quickly to market signals.

Large organisations should be breaking down in small divisions. Keeps units small and autonomous so that employees feel a sense of ownership and are responsible for their own results. These companies also retain the benefits size, especially in marketing and manufacturing. Size is used to leverage economies of scale and scope, not to become a checker and controller that slows the organisation down. There is a delicate balance among size, autonomy, teamwork, and speed, which these ambidextrous organisations are able to engineer. An important part of the solutions is massive decentralisation of decision-making. A common overall culture is the glue that holds these companies. The tight-loose aspect of culture is crucial for ambidextrous organisations. Leaders both encourage the culture and know enough to allow appropriate variations to occur across business units. These companies promote both local autonomy and risk taking and ensure local responsibility and accountability through strong, consistent financial control. Ambidextrous managers ensure that the organisation avoids becoming arrogant and remains willing to learn from its competitors. These leaders venerate the past, but are willing to change continuously to meet the future. The bottom-line is that ambidextrous organisations learn by the same mechanism that sometimes kills successful firms: variation, selection, and retention. They promote variation through strong efforts to decentralize, to eliminate bureaucracy, to encourage individual autonomy and accountability, and to experiment and take risks. This promotes wide variation in

products, technologies and markets. These firms stay close to customers and are able to respond quickly to market signals.

Appendix 1G2 - Structural and cultural inertia

Successful companies learn what works well and incorporate this into their operations. A lack of congruence (or internal inconsistency in strategy, structure, culture and people) is usually associated with a firm's current performance problems. Achieving congruence is an ongoing process requiring continuous improvement and incremental change. As companies grow, they develop structures and systems to handle their increased complexity. These structures and systems are interlinked so that proposed changes become more difficult, more costly, and require more time to implement. This results is structural inertia- a resistance to change rooted in the size, complexity and interdependence in the organisation's structures, systems, procedures, and processes. Cultural inertia comes from age and success. The more successful the organisations have been the more institutionalised or ingrained these norms, values, and lessons become, and the greater the cultural inertia-the greater the organisational complacency and arrogance. In relatively stable environments, the firm's culture is a critical component of its success. Yet, when, confronted with discontinuous change, culture can quickly become significant barrier to change. The issue is to manage organisation culture that can cope both incremental and discontinuous changes. The organisation competitive advantage is in the culture shared throughout the organisation, that provides a level of service that competitors found difficult to imitate. The resistance to change could be underlined in organisational inertial (cultural and structural).

Appendix 1G3 - Product life cycle shifts

As the product class matures and moves through the three stages of growth: innovation, differentiation and maturity, the basis of competition shifts. Each of these stages requires different competences, strategies, structures, cultures and leadership skills. In the early stages of a product class, competition is based on product variation (development of new products and services) in

the later stages competition shifts to features, efficiency and cost. Technology cycles are made by the dynamic of product, service and process innovation, dominant design, and substitution events.

Technology cycles begin with a proliferation of innovation in products or services as the new product or service gains acceptance. Once it is clear that a dominant design has emerged, the basis of competition shifts to process innovation, driving down costs and adding features. Instead of competing through product service innovation, successful strategies now emphasise compatibility with the standard and productivity improvement. This competition continues until there is a major new product, service, or process substitution event and the technology cycle kicks off again as the basis of competition shifts back again to product or service variation. As technology cycles evolve, bases of competition shit within the market. Organisations change their strategy and this usually requires a revolutionary change.

Appendix 1G4 - Evolutionary theory

For many years, biological evolutionary theory proposed that the process of adaptation occurred gradually over long time periods. The process was assumed to be one of variation, selection, and retention. Variation led to adaptation, which was subsequently retained across generations. The environment changed gradually and species adapted slowly to these changes. Instead of slow changes, discontinuities require a different version of Darwinian theory-that of punctuated equilibria in which long periods of gradual change were interrupted periodically by massive discontinuities. Under these conditions, survival or selection goes to those spices with the characteristics needed to exploit the new environment.

Research on organisations has demonstrated similarities between populations of insects and animals and populations of organisations. This field known as " organisational ecology" has successfully applied models of population ecology to the study of sets of organisations. The results confirm that populations of organisations are subject to ecological pressures in which they evolve through periods of incremental adaptation punctuated by discontinuities. Variations in organisational strategy and form are more or less suitable for different environmental conditions.

Those organisations and managers who are most able to adapt to given market or competitive environment will prosper.

Appendix 1H - Generic strategies and Strategic typologies

Generic strategies were constructed in a variety of fields: declining industries, Harrigan (1980); vertical integration, Harrigan (1984); turnaround situations, Hofer (1980); manufacturing business, (Galbraith and Schendel, 1983 and Robinson and Pearce 1985); strategic growth, Pitts (1977); and low-share business, Woo and Cooper (1982). Galbraith and Schendel, (1983), Karnani (1984) and White (1986) among others, surveyed generic strategies.

At the corporate level, Chandler (1962) characterised four phases of evolution in organisational strategy and structure in large American industrial enterprises, which he designated as: I – Accumulating resources (initial expansion and accumulation of resources); II – Rationalisation of the use of resources; III – Continued Growth (expansion into new markets and lines to help to assure the continued maximum use of resources; and IV – Rationalising the use of expanding resources (development of a new structure to make continuing effective mobilisation of resources possible to meet both changing short term market demands and long-term market trends).

Following the work conducted by Chandler, Ansoff (1965) recognised four competitive strategies, at the corporate level, i.e.: (1) Market penetration; (2) Product development; (3) Market development, and (4) Diversification; and four competitive strategies at the business level, i.e.: (1) Market-share maximisation; (2) Growth (securing organisational continuity); (3) Market differentiation, or market niche (creating a distinctive image in the minds of potential customers for a firms' products/services); and (4) Product/service differentiation, or product niche (which differentiates the performance of the product/service from competitors' product/services).

Other researchers have developed strategic typologies for market share objectives, i.e. Buzzell, Gale, and Sultan (1975), Vesper (1979), and Wissema, Van der Pol and Messer (1980).

Buzzell, Gale, and Sultan (1975) distinguished three strategic types for market share growth: (1) Building - high investment to increase market share position; (2) Holding - investment at market

norms to maintain market share (3) Harvesting - low investment allowing market share to decrease, cost controls to generate cash flow and profitability.

Vesper (1979) recognised four strategy types for market share objectives: (1) Multiplication - expansion of the market share by multiplying market structures; (2) Monopolising - eliminate competition, establish barriers to entry, and control resources; (3) Specialisation - specialise in products and/or production process; (4) Liquidation - give up business and market position.

Wissema, Van der Pol and Messer (1980) differentiated six strategy types for market competitive position and market share: (1) Explosion - improve competitive position in short term; (2) Expansion - improve competitive position in long term; (3) Continuous growth - maintain position in expanding markets, normal investment; (4) Slip - give up market share to generate cash in growing market; (5) Consolidation - give up market share to generate cash in stable market and (6) Contraction-liquidate assets and terminate market position.

Hofer and Schendel (1978) developed a typology of six strategic types for profitability and market share: (1) Share increasing - high investment to increase market share; (2) Growth - maintain position in expanding markets, investment at industry norms; (3) Profit - investment at industry norms, cost controls to “throw off cash”; (4) Market concentration and asset reduction - realignment of resources into focused, smaller segments; (5) Turnaround - improve posture, may require investment; (6) Liquidation - generate cash while withdrawing from market.

Utterback and Abernathy (1975) were concerned with the performance characteristics and they identified three strategy types for maximising performance: (1) Performance maximising - emphasis on product and/or service performance, technology, and product R&D; (2) Sales maximising - marketing emphasis to increase total sales and market share of firm; (3) Cost maximising - emphasis placed on process technology/R&D to decrease total cost of production.

Miller and Friesen (1978) and Miles and Snow (1978) focused their attention on the organisational strategic adaptive behaviour to the environment. Miller and Friesen analysed corporate strategy level and Miles and Snow business strategy level.

Miller and Friesen (1978) described ten archetypes for explaining organisational corporate adaptive behaviour. They have analysed the relationships of the organisation by using structural and strategy variables, with the environment. They identified six successful archetypes: S1a - the adaptive firm under moderate challenge; S1b - the adaptive firm in a very challenging environment; S2 - the dominant firm; S3 - the giant under fire; S4 - the entrepreneurial conglomerate; S5 - the innovator, and four failure archetypes: F1 - the impulsive firm; F2 - the stagnant bureaucracy; F3 - the headless giant; F4 – Swimming upstream-the aftermath.

Miles and Snow (1978) identified four strategic patterns, (1) Defenders, (2) Prospectors, (3) Analysers and (4) Reactors of the organisation adaptive process to the environment.

Porter (1980) and Galbraith and Schendel (1983) at the business level identified a configuration of competitive strategies.

Porter (1980) identified three organisational competitive generic strategies for creating a defensible position and outperforming competitors in a given industry: (1) Overall cost leadership, (2) Differentiation and (2) Focus. From all the strategic classifications, perhaps the best known is Porter. His strategic typology has been extensively empirically tested.

Galbraith and Schendel (1983) identified strategies types for the industrial and for the consumer settings. They distinguished six strategy types for consumer products, and four strategy types for industrial products, to explain competitive position in the market place. The six strategy types for consumer products were denominated: (1) harvest; (2) builder; (3) cashout; (4) niche or specialisation; (5) Climber and (6) continuity. The four strategy types for the industrial products were labelled as: (1) low commitment, (2) growth, (3) maintenance, and (4) niche or specialisation.

Mintzberg (1988) proposed an alternative typology to Porter's generic strategies that encompasses the increased complexity of the organisation within its environment. Mintzberg developed his typology in two parts**:** differentiation and scope. Differentiation identifies what is fundamentally distinct about a business in the marketplace, as perceived by its customers. He distinguishes six fields where firms can differentiate: quality, design, support, image, price and undifferentiation. Scope identifies the markets where the business competes. Mintzberg stated that his dimensions are analytically distinct and collectively exhaustive in describing the options available to firms. He has also suggested that typologies of strategy that may have been adequate in earlier periods (when the nature and pace of economic and technological change was fundamentally different) may not now be an appropriate explanatory tool for a rapidly changing environment.

Porter's Generic Strategies (1980)

From all the strategic classifications mentioned, perhaps the best known is Porter's (1980) generic strategies. Porter's strategic typology has been extensively theoretically and empirically tested. He identified three broad competitive strategic groups for the industrial context aiming economic performance (analysed in terms of market share and profitability). The next section describes and analyses his theory and conceptualisation in detail.

Porter's generic strategies concept

Porter developed three potentially successful generic strategies: (1) Overall cost leadership (2) Differentiation; and (3) Focus, for creating a defendable position and outperforming the competitors in an industry. Each of these strategy types will be defined in turn:

(1) *Overall cost leadership* strategy.

This strategy emphasises on a low cost position, relatively to competitors. Cost leadership requires aggressive construction of efficient-scales facilities, cost reductions which are achieved

through experience, tightly controled costs, avoidance of marginal customer accounts, and cost minimisation in areas like R&D, services, sales force, and advertising. A wide line of related products that are easy to manufacture, helps to build volume, and attain economies of scale.

(2) *Differentiation*

Differentiation strategy emphasises on the development of something, either a product or a service that is perceived *industrywide* as being unique. It can be accomplished through design or brand image, technology, product or service features, customer service, and dealer network, among other dimensions. The organisation does not disregard costs, however they are not the primary strategic targets. Differentiation is normally associated with exclusivity, allowing the organisation to charge a high premium price.

(3) *Focus strategy*

Focus strategy emphasises on a particular group of customers, product line segments, or geographic markets. It either assumes the differentiation strategy or low cost position, or both, but only from the perspective of a narrow market target. Low cost and differentiation strategies are directed at industry wide objectives, targeting the market as a whole. Focus strategy aims to serve a particular segment very well. It is assumed that the organisation serves its narrow strategic target more effectively, or efficiently than competitors, who are broadly competing.

Failing to pursue one of these three strategies indicates that the firm is “stuck in the middle” which means that the organisation does not benefit from the advantages of any of these strategy types. As Porter stated, “stuck in the middle” is (1980:41) “an extremely poor strategic situation,... is almost guaranteed low profitability.”

As seen in this section, Porter’s concept has been described. Porter’s generic strategies have been extensively theoretically and empirically tested. The next section discusses and analyses Porter’s empirical support.

<u>Operationalisation of Porter’s generic strategies, empirical support.</u>

There is some evidence that supports the validity and the explanatory power of Porter's approach (Govindarajan, 1988; Harrigan, 1985; Miller and Friesen, 1986a, 1986b; Woo and Cooper, 1981; and Wright, 1987).

Some of the researchers tested the typology using the Profit Impact of Market Strategies-PIMS database (i.e. Anderson and Zeithaml, 1984; Douglas and Rhee, 1989; Phillips, Chang and Buzzell, 1983; and White, 1986). Others verified it by using a survey questionnaire (i.e. Bowman, 1996; Dess and Davis, 1984; Hall, 1980; Kim and Lim, 1988; Miller, 1988; Robinson and Pearce, 1988; Nayyar, 1993; and Silva, 1996). Calingo (1989) has used content analysis of annual reports. And some researchers have even demonstrated it conceptually (i.e. Hill, 1988; Karnani, 1984; and Murray, 1988).

Porter's generic strategies were also applied to a broad variety of different industries: paints and allied, Dess and Davis, (1984); electronics, Kim and Lim (1988); clothing, McNamee and McHugh (1989); electronics, financial services, home appliances, food and beverages, industrial equipment, lumber, construction, retailing and mining, Miller, (1988); and in particular Silva (1996) within the Portuguese mould industry. Silva (1996) have empirical tested the relationships of Porter's generic strategies with performance on 44 manufacturing and intermediary (trade) firms. His findings suggest that firm's only orientated to low cost, showed low profile. Firm that followed a differentiation strategy with moderate emphasis on costs exhibited high profile.

Though developed in America, Porter's strategic typology has been validated in other countries. Douglas and Rhee (1989) compared generic strategy types in America and in Europe; Green, Lisboa and Yasin (1992), and Silva (1996) examined it in Portugal; Kim and Lim (1988) verified it in Korea; and Miller (1988) tested Porter's generic strategies in Canada.

Though Porter's work has been criticised and subsequently refined. Miller (1988) studied an extended version of Porter's generic strategies, i.e. the relationships of structures and environments within undiversified firms. He made a clear distinction between innovative

differentiation and marketing differentiation. Innovative differentiation endeavours to create the most up-to-date and attractive products by leading competitors in quality, efficiency, design innovations, or style. Marketing differentiation attempts to develop a unique image for a product by marketing practices, e.g. advertising, status price, quality image, etc. According to Bowman (1996) the division of differentiation strategy on product innovation and marketing is very important, especially when firms are simultaneously employing differentiation and cost leadership strategies. Kim and Lim's (1988) findings identified four strategic groups: stuck in the middle; overall cost leader; product differentiator; and marketing differentiator. Their results were generally consistent with the generic strategies identified by Porter (1980) and Miller (1988). Green, Lisboa and Yasin, (1992) also identified extended strategic groups: differentiation strategies, focus/differentiation; service orientation; cost leadership (but not concerned with competitive price). Bowman, (1996) explored whether managers interpret the competitive strategy of their firm in line with Porter's generic strategies. His findings reveal four strategic groups: competing on price; offering unique products/services; cost control; product/service development.

Criticism of Porter's Generic strategies

Porter alleges that firms may adopt any of his generic strategy types. However, it has been argued that the choice of generic strategies are dependent on firm size, access to resources, and industry competition; in particular, industry life cycle, competition brand orientation, product diversity, competitors accessibility to gains on economy of scale, among other factors. Large organisations, with abundant resources, may compete in cost leadership or differentiation strategies. Similarly small firms can only succeed pursuing focus strategy, (Wright and Parsinia, 1988). Hambrick (1982) and Murray (1988) defended that strategies should be understood according to the environmental context in which firms are embedded. As Hambrick (1982:212-220) stated " it is simply not accurate to say that all generic strategies are equally viable within an industry...any broadly 'generic' strategy is really a composite of numerous variations, not all of which are equally suited to a given situation."

Generic strategies generally emerge in industries that have clearly leaders and followers (large and small organisations). However if we deal with fragmented industries, we have a different scenario. “Fragmented industries are those in which there are a number of competitors, and no single enterprise has a significant market share that would allow it to strongly influence the industry setting”, (Wright and Parsinia, 1988:22). In fragmented industries the strategy choice of low cost for example may be determined by initial low investments and low operating costs, rather than through economy of scales, as suggested in Porter’s typology.

Porter suggests that successful firms should follow one of his generic strategies. Each of the Porter’s specific generic strategies requires different organisational procedures, different control systems, incentives, structures, leadership styles, and different organisational cultures. Therefore in order to achieve success it is necessary to commit to one strategy (Porter, 1980). However, business level analyses have suggested the presence of combined strategies, questioning the mutual exclusivity of cost-leadership and differentiation strategies. Researchers have demonstrated conceptually (Hill, 1988; Karnani, 1984; Murray, 1988) and empirically (Dess and Davis, 1984; Hall, 1980; Hambrick, 1982; Phillips et al., 1983; Miller, 1988; Miller and Friesen 1986a, b) that cost leadership and differentiation are not mutually exclusive strategies, but two dimensions of any competitive strategy. Wright and Parsinia (1988:21) state that “firms can and do successfully compete with multiple strategies.” Wright and Parsinia (1988) emphasised the relationship of a firm’s size and the multiple use of the generic strategies. He argued that, large firms competing with the differentiation strategy may only pursue it or may do so in combination with focus strategy. Kim and Lim (1988) demonstrated that differentiators employed cost leadership strategy, and cost leaders employed significant elements of differentiation. Organisations may encompass a small part of every strategy because they are competing with all the firms, independent of where they are suitable in Porter’s typology. According to Murray (1988), a cost leader that competes with a product differentiator must also be a product differentiator, and vice-versa.

Porter (1980) in fact, is not very clear whether firms can simultaneously pursue more than one of his generic strategies. On one hand, he says that each strategy requires specific organisational

systems to be implemented; therefore it has been assumed that organisations can only gain the benefits of optimising a firm's strategy if they just follow one. On the other hand, he does say that firms *can* pursue more than one of his generic strategies at the same time: "this may not be true in all industries...differentiation may not be incompatible with relatively low costs" Porter (1980:28). The four following Porter's statements confirm this lack of clarity:

- "identify three internally consistent generic strategies (which can be used singly or in combination) for creating such defendable position in the long run and outperforming competitors in an industry." Porter (1980:24);
- "business differentiation may be not incompatible with relatively low cost and comparable prices to those of competitors." Porter (1980:28);
- "low overall cost position, may not be incompatible with differentiation or focus,... Most importantly is deciding which of the three generic strategies is appropriate for the firm. This choice rests on picking the strategy best suited to the firm's strengths and one least applicable by competitors" Porter (1980:44).
- "sometimes the firm can successfully pursue more than one approach as its primary target, though this is rarely possible." Porter (1980:25);

As Green, Lisboa and Yasin (1992:5) reveal "Porter theory,...lacks overall strategic usefulness in predicting and explaining behaviour." Porter is concerned with the external environment of the firm and its position in the market, rather than how the organisation and its resources can influence and be influenced by the environment. The same query was emphasised by Bowman (1996), as he stated, "Porter's generic strategies are more a decision about *where* to compete than about *how* to compete?" Bowman (1996:70)

Miller and Friesen (1986a,b) studied Porter's generic strategies and performance; they allege that what causes successful performance is strategic advantage, rather than devotedly following Porter's generic strategies.

In conclusion, Porter work has been criticised for its conceptual limitations and from a concern that the generic strategies identified are not mutually exclusive; are not collectively exhaustive

and thus are unable to describe the full array of possible strategies adequately. They are based on simplistic notions of low cost and differentiation, in a current corporate environment characterised by increased global competition and social, economic, political and technological change, (see Wright, 1987; Hill, 1988; Chrisman et al., 1988 and Mintzberg, 1989).

Appendix 1H1 - Miles and Snow's (1978) research evidence

Table 1H1a – the operationalisation of Miles and Snow's strategic typology in a wide variety of manufacturing and services industries

Manufacturing or service industries	Researchers
Banks	McDaniel and Kolari (1987) Floyd and Wooldridge (1992) and James and Hatten (1995)
Chemical	Thomas and Ramaswamy (1996)
Churches	Odom and Boxx (1988)
College	Hambrick (1981a, 1981b)
Civil construction	Usidken, Sozen and Enbiyaoglu (1988) and Floyd and Wooldridge (1992)
Electronics manufacturers	Smith, Guthrie and Chen (1989) and Thomas and Ramaswamy (1996)
Forest products	Slater and Narver (1993)
Hospitals	Hambrick (1981a, 1981b) Meyer (1982) Barret and Windham (1984) Zahra (1987) Luke and Begun (1988) Zajac and Shortell (1989) Shortell and Zajac (1990) and Floyd and Wooldridge (1992)
HMOs	Conant, Mokwa and Wood (1987) and Conant, Mokwa and Varadarajan (1990)
Insurance	Hambrick (1981a, 1981b), and Floyd and Wooldridge (1992)
Petroleum refining	Floyd and Wooldridge (1992), and Thomas and Ramaswamy (1996)
Plastics, automotives and air transportation	Snow and Hrebiniak (1980)
Retailing	Hawes and Crittenden (1984)
Salespersons	Slocum, Cron, Hansen and Rawlings (1985)
Semiconductor manufacturers	Snow and Hrebiniak (1980) and Namiki (1989)
Tobacco	Chaganti and Sambharya (1987) and Miles and Cameron (1982)
Biotechnology, paper production, sporting goods, publishing, heating, ventilation and air conditioning contractors, natural gas, food service, precision optics, grocery products, consulting, petroleum refining, and reprographics	Floyd and Wooldridge (1992)

Table 1H1b - Miles and Snow's research evidence

Researchers	**Investigated**	**Sample,** size, industry, location, size firms, business level, realised, current or intended strategy, longitudinal study/ cross-sectional	**Measurements**	**Data analysis**	**Results**	**Support**
Snow and Hrebiniak (1980)	Strategy, distinctive competences and organisational performance. Covered: Defenders, Analysers, Prospectors and Rectors ***H1****-Top managers will report that all four strategies are being pursued in their industry, with Defenders, Prospectors, and Analysers distributed about equally and far outnumbering Reactors.* ***H2****- Top managers who identify their organisations as Defenders will perceive distinctive competence in general management, production, applied engineering, and financial management.* ***H2****-Top managers who identify their organisations, as Prospectors will perceive distinctive competence in general management, product research and development, and basic engineering.* ***H4****- Top managers who identify their organisations, as Analysers will perceive distinctive competence in general management, production, applied* engineering, and marketing/selling. ***H5****-* Top managers who identify their organisations, as Reactors will have no consistent patterns in their perceptions of distinctive competence. ***H6****-* Defenders, Prospectors, and Analysers will be better performers than Reactors in each of the industries studied.	247 questionnaires, from 88 companies. Plastics, semiconductors, automotives and air transportation, in U.S. Small firms (less than 400 employees), medium (400-2000 employees) and large firms (more than 2000 employees) Business Level. Realised, Intended Strategy Cross-sectional study	Questionnaire and secondary data. Distinct competences: 145-item questionnaire of top managers. Organisational strategy: top manager's perceptions for the period 1-2 years from now, self–typing approach Performance: Profitability – ratio of total income to total assets- ROA	Distinctive competences: univariate analysis of variance Multivariate analysis. Simple correlation and factor analysis Pearson product-moment correlations between the distinctive competences for all Defenders in the four industries	Managers perceived the four strategy types to be present in their industry. Numeric dominance of Defenders and Prospectors. Influence of government regulation in the air transportation industry. Defenders and Prospectors had different distinctive competences. Top managers in Defender's organisations consistently perceived general management, financial management, production and applied engineering distinctive competencies, and in Prospector's organisations consistently perceived general management, product R&D, market research and basic engineering distinctive competencies. Analyser's distinctive competencies were considerably less evident. Reactors, as predicted, have not show a consistent pattern of distinctive competence. Defenders, Prospectors and Analysers consistently outperformed Reactors, in competitive industries, but not in highly regulated industries (e.g. air transportation), where Reactors performed the three other strategy types. Top managers consistently identified Defenders with manufacturing efficiency and Prospectors with product and market effectiveness.	Validated the typology.
Hambrick (1983)	Strategic typology (entrepreneurial, engineering problems and competitive devices) different environments, and performance. Covered: Defenders and Prospectors	PIMS (Profit Impact of Market Strategies) database, in U.S. Business Level.	Strategic typology: operationalised according to actions relative to the competition - % of sales. 12 items among Entrepreneurial, engineering	t-test, multivariate regressions, nonparametric sign test.	Prospectors had higher ratio of product R&D and marketing expenses than Defenders. Supported the entrepreneurial problem.	Mixed validated the typology

	***H1**-On average Prospectors and Defenders have equal performance levels.* ***H1a**-On average Prospectors and Defenders have equal performance levels as measured by profitability, cash flow, and market share change.* ***H2a**-Prospectors spend more on product R&D, as % of sales, than do Defenders.* ***H2b**-Prospectors have higher marketing expenses (sales force, promotion, and marketing administration), as % of sales, than do Defenders.* ***H2c**-Prospectors are more vertically integrated forward than are Defenders.* ***H2a**-Defenders have greater fixed asset intensity than do Prospectors.* ***H2b**-Defenders are more vertically integrated backward than are Prospectors.* ***H2c**-Defenders have greater value added per employee than do Prospectors.* ***H2d**-Defenders have greater capacity utilisation than do Prospectors.* ***H2e**-Defenders have lower average compensation rates than do Prospectors.* ***H2f**-Defenders have lower overall direct costs than do Prospectors* ***H2g**-Defenders spend a greater portion of their total R&D expenditures on process improvements than do Prospectors.* ***H4a**-Defenders have lower prices than do Prospectors.* ***H4b**-Defenders provide better service than do Prospectors.* ***H4c**-Defenders provide better quality than do Prospectors.*	Realised strategy Strategic typology based on top management tasks: entrepreneurial-domain selection and adjustment; engineering-throughout processing; administrative-establishment of roles and relationships Cross-sectional study	and competitive devices (price, service and quality). Environmental variables-product life cycle and industry new product innovation define four environments: growth-noninnovative growth-innovative, mature-noninnovative and mature-innovative industry. Performance: Profitability (Return on Investment - ROI, Cash flow on investment-CFOI), and Market Share.		Defenders had higher capital intensity, high employee productivity, and low direct costs, than Prospectors. Supported Defenders' efficiency orientation. Defenders and Prospectors differed in performance depending on the nature of the environment and the measure of performance utilised. Defenders outperformed Prospectors on profitability (cash flow) in noninnovative industries. Prospectors outperformed Defenders on market share gains, in innovative industries. Strategy should be a function of the embedded environment and the performance required at a given time.	
McDaniel and Kolari (1987)	Strategy types, and marketing elements. Covered: Defenders, Prospectors and Analysers ***H1**-Marketing officers who identify their organisations as Prospectors or Analysers tend to view new product development activities as being a more important component of organisational strategy than do marketing officers who identify their organisations as Defenders.* ***H2**- Marketing officers who identify their organisations as Prospectors or Analysers tend to view location/distribution innovations as being a more important component of organisational strategy than do marketing officers who identify their organisations as Defenders* ***H2**-Marketing officers who identify their organisations as Defenders, Prospectors or Analysers tend to have similar views*	279 firms in the banking industry, on changeable environment, in U.S. Small, medium and large banks. Corporate level Intended strategy Cross-sectional	Questionnaire to top marketing managers Strategy types: self-typing approach. Intended strategy: for the next five years. Marketing elements: 16 dimensions, based on- new product development; place-location/distribution; Price; Promotion; marketing research; and 4 items for integration/ diversification strategies.	Cluster analysis, multiple discriminant analysis, MANOVAs, ANOVA, and Duncan multiple-range test. Multivariate testes.	Defenders were organisations consistently lacking of marketing orientation. Their concern was their current products in their industry. Prospectors strongly marketing orientated, exploring new product developments and new market opportunities. Analysers, fit in between. They either adopted the Defender or Prospector strategic marketing orientation.	Overall support the typology

	about the importance in organisational strategy of pricing of products/services ***H4**-Marketing officers who identify their organisations as Prospectors or Analysers tend to view promotional activities, including personal selling, advertising, sales, promotion, and public relations, as being more important to organisational strategy than do marketing officers who identify their organisations as Defenders* ***H5**-Marketing officers who identify their organisations as Prospectors or Analysers tend to view marketing research activities as being more important to organisational strategy than do marketing officers who identify their organisations as Defenders.*					
Namiki (1989)	Strategic typology (entrepreneurial, engineering and administrative problems), environment and performance Covered: Defenders, Prospectors, Analysers, and Reactors ***H1**-Overall, organisational attributes and strategy dimensions described by Miles and Snow for each strategy type closely resemble those empirically derived clusters of firms.* ***H1a**-The description of the three strategy components, i.e. product-market scope change, competitive advantage, growth direction, for each strategy type by Miles and Snow closely resembles those empirically derived clusters.* ***H1b**-Major determinants for clustering firms into the four strategy types are factors pertaining to a product-market change.* ***H2a**-Prospectors, Analysers, and Defenders outperform Reactors in all the performance measures, i.e., sales growth, ROA, and overall performance.* ***H2b**-Prospectors have a higher sales growth than Analysers, Defenders and Reactors.* ***H2c**-Defenders have a higher ROA than Analysers, Prospectors and Reactors.* ***H2**-There is a strong association between the strategy types and the degree of perceived environmental uncertainty.*	106 semiconductor manufacturer firms in dynamic and changeable environment, in U.S. Medium firms Business level Realised strategy Cross-sectional study	Questionnaire to top managers Strategic typology: 12 dimensions based on, (product-market scope, competitive advantage, and growth vector) customer base stability, new product development, and growth pattern; production employees' skills, and strengths of functional departments. Environment: measure on technological and market uncertainties. Performance: subjective self-report instrument - growth in sales, Return on total assets-ROA, and "overall" performance of the firm.	Cluster analysis, variance analysis, and Chi-square.	Strong strategic typology consistency was found for the Prospectors, but some inconsistencies were found for the Defender strategy. The three strategy types did not perform equally well in any industry as predicted by Miles and Snow. Prospectors, in such dynamic and changeable environment, outperformed Defenders and Analysers in terms of sales growth. Namiki's corroborated the view that certain environments favour certain strategies.	Generally moderately support the validity of the typology.
Smith , Guthrie and Chen (1989)	Strategy types (entrepreneurial, engineering, and administrative, problems) and its relationship between size and performance Covered: Defenders, Prospectors, Analysers and Reactors ***H1**- Prospectors, Defenders and Analysers will perform equally well and will outperform Reactors.*	45 electronic manufacturing firms, in U.S. Small (less than 20 employees) , medium (between 20 and 200 employees) and large firms (over 200 employees)	Interviews and Questionnaires to CEOs and top managers team Strategy types: 11 dimensions assess Defenders and Prospectors top-level manger's perceived approaches to the entrepreneurial and engineering problems;	Cluster, factor analysis and multiple regression, ANOVA	Overall Defenders, Analysers and Prospectors performed equally well and outperformed Reactors. Related to the typology operationalisation, support was provided for the Analyser and Prospector strategies but there was less evidence for the Defender	Overall, Support for the validity of the typology

	***H2**- The distribution of Defenders, Prospectors, Analysers and Reactors will vary according to size. Analysers will tend to be large firms, Reactors will be small firms, and Defenders and Prospectors will fall between these two extremes, with Defenders being larger than Prospectors.* ***H2**-There will be a significant interaction between strategy and size, on performance. Specially, the contingency effect of organisation size on strategy and performance will be positive for Analysers and Defenders, and negative for Prospectors. Reactors should perform poorly regardless of size.*	Business level Realised strategy Cross-sectional study	multiple categories of product markets assess Analysers, and consistent "no approach" category assess Reactors. Six open-ended questions assess components of engineering and administrative problem. Organisational size: full-time employees, obtained from interviews and archival sources Performance: subjective self-report, i.e. evaluation of the firm's performance compared with competitors, on sales growth-SGR, profits (as a % of sales), return on assets - ROA, and "overall" performance.		strategy type. Firm's size can explain differences in the relationship between strategy and performance. Analysers were large firms and Reactors small. Few differences were denoted between the size distribution of Defenders and Prospectors. Prospectors ascertained as large firms and Defenders as small. Reactors were poor performers.	
Zajac and Shortell (1989)	Strategy types, Strategic changes over time, and its likely direction in response to the changing environmental conditions. Performance implications. Covered: Defenders, Prospectors, and Analysers ***R1**-Are changes in strategy made by organisations in response to a common environmental shift rare or common?* ***R2**- Are changes in strategy made by a set of organisations in response to a common environmental shift randomly distributed or distinctively patterned?* ***R2**-Does the likelihood of a firm's change in strategy, in response to a common environmental shift, differ by the type of strategy, which has been pursued prior to environmental shift?* ***R4**- Are Defenders least likely to change their strategies in response to a common environmental shift?* ***R5**- Are Defenders most likely to change their strategies in response to a common environmental shift?* ***R6**-Are Defenders less profitable than Prospectors and Analysers strategies in a new health care environment?* ***R7**-Are firms that do not change strategies less profitable than firms that do?* ***R8**-Are firms changing to Defenders less profitable than firms changing to Analysers and Prospectors?*	422 hospitals in a rapidly changing environment, in U.S. small, medium or large hospitals - unknown Business Level Realised strategy Longitudinal study	Primary and secondary data was collected in 1982 and 1984 Strategy types: 1) Prior strategy- questionnaire, self-typing approach. It was given to CEOs to describe their strategy type two years ago, based on service diversification. 2) The current strategy: 2 years later, based on new service/new market development emphasis Performance- data collection on profitability: profit margin ratio	Frequency data, Chi-square goodness-of-fit test, and discriminant analysis. Multiple regression analysis. One-way ANOVA	Organisations change strategies in response to environmental changes. Organisations have changed their strategy; they moved way from one strategy type to other strategy type. Organisations do not all perceive strategy types to be equally viable in new environments. Organisation's *priori* strategy can be a discriminator of organisations that changed strategies versus those that did not. Prospectors and Analysers hospitals outperformed in terms of profitability Defender hospitals in a proactive environment. Simply changing strategies does not necessarily imply performance advantages vis-à-vis. Organisations that changes strategies did not outperformed those that did not change.	Moderately support the typology

Conant, Mokwa and Varadaraja n, (1990)	Strategy types (entrepreneurial, engineering and administrative , problems) distinctive marketing competences and organisational performance Validity of self typing paragraph approach Covered: Defenders, Prospectors, Analysers, and Reactors	150 American Health Maintenance Organisations-HMOs, in the early growth stage of its life cycle Small, medium or large hospitals-unknown Business and Functional level Realised strategy Cross-sectional study	Questionnaire to a marketing directors Strategic typology: multi-item scale and self-reporting paragraph approach. Distinctive marketing competences: 20 item scale supported on extensive literature review. The scale required respondents to evaluate how well or poorly they perceive their organisation performs specific marketing activities relative to their competitors Organisational performance-subjective self-report: (1), which compares the organisation's profitability with its competitors; (2) which evaluates their organisation's performance in reference to Return on investment – ROI. The two previous measures form the third-"overall" organisational performance	Chi-square ANOVA, F-statistics, Tukey-Kramer paired comparison	Prospectors presented superior marketing competences (in exploring new product and market opportunities) compared to other strategy types. Defenders had relatively weak marketing competences, however they overall performed favourably. Reactors had weak marketing competences and performed poorly. All the three archetypes performed equally well, and outperformed the Reactors.	Overall validate the typology
Shortell and Zajac (1990)	The reliability and the validity of the Miles and Snow's various measures Strategic typology (entrepreneurial/administrative problems), intended and realised strategy Covered: Defenders, Prospectors, and Analysers ***H1****- Organisations classified as Prospectors are likely to (a) place greater emphasis on new service and new market development strategies, (b) offer more diversified services-services that are not part of their core business-(c) have initiated more diversified new services in recent years, (d) have higher ratio of diversified to nondiversified services, (e) offer more high-technology services, and (f) have a greater number of new diversified services planned for the future than organisations classified as Analysers. Analysers are more likely than Defenders to have the higher levels noted.* ***H2****- Organisations classified as Defenders will have the lowest percentage of their services in high-growth areas and Prospectors will have the highest percentage in high-growth areas. Analysers will occupy and intermediate position.* ***H2****- Organisations classified as*	574 hospitals, in U.S., in a rapidly changing industry Small and medium hospitals Corporate level and business level Intended strategy Longitudinal study	Perceptual and archival data were collected in 1984-85 and 1986-87. Strategic typology: Self-typing questionnaire, of CEO's perceptions of their organisations' overall strategic orientations, new-market , new- service development, market growth, corresponding to the entrepreneurial dimension and strategic planning – involving, formality, innovativeness and market research capability, corresponding to the administrative dimension. Interviews with top mangers for strategic planning, finance, marketing and human resources, and related functional areas. Archival data, included inventory of services of each hospital; and services data from the American Hospital Association. Intended and realised strategy: Analysed the relationship between an organisation's	The reliability of the self-typing measure was assessed through a test-retest approach: index of concentration as a measure of interraterreliability, and Factor analysis The validity of the measures was examined through one-way analysis of variance using Duncan multiple range tests. Correlations and ANOVA	Overall, the results provided strong support for the measurement validity of Miles and Snow' strategy types. Prospectors scored higher in all the types on measures of the entrepreneurial dimension of the typology. Defenders scored lower and Analysers in between. Prospectors had the highest score in planning innovativeness and market research, and were followed by Analysers and Defenders. Hospitals, two years later (intended strategy), increased emphasis on diversification services, due to environmental changes.	Strongly support the typology

	Prospectors will emphasise new market and new service development strategies in their core business more than Analysers, who in turn will emphasise such strategies more than Defenders. ***H4-*** *Organisations classified as Prospectors are likely to (a) offer greater number of diversified services two years after data are first collected and (b) initiate more new diversified services over the two-year period than Analysers. Analysers will have higher levels than Defenders.* ***H5-*** *Organisations classified as Defenders will score the highest of the three types studied on planning process formality, followed by Analysers and Prospectors.* ***H6-*** *Organisations classified as Prospectors will score the highest of the three types studied on planning innovativeness, followed by Analysers and Defenders.* ***H7-*** *Organisations classified as Prospectors will make the strongest market research efforts of the three types studied, followed by Analysers and Defenders.*		strategic orientation at one point in time and two years later.			
Slater and Narver (1993)	Profitability on the entrepreneurial dimension. The relationships between organisational characteristics and profitability for the strategy types. Covered: Defenders, Prospectors, and Analysers ***H1a-****There is a positive relationship between SBU autonomy and profitability for Prospector and Analyser business units.* ***H1b****- There is a negative relationship between SBU autonomy and profitability for Defender business units.* ***H2a****- There is a positive relationship between market orientation and profitability for Prospector and Analyser business units.* ***H2b -****There is a negative relationship between market orientation and profitability for Defender business units.* ***H2a -****There is a negative relationship between HRM emphasis and profitability for Prospector business units.* ***H2b -****There is a positive relationship between HRM emphasis and profitability for Analyser and Defender business units.* ***H4a -****There is a negative relationship between relative cost and profitability for Prospector, Analyser and Defender business units.* ***H4b –****Achievement of low relative cost is*	271 questionnaires from 116 SBUs, in highly diversified forest products, Large firms Business level Realised Strategy Cross-sectional study	Questionnaires to top managers team. Entrepreneurial dimension: proactiveness, basis for competitive advantage, and market focus. Performance: subjective self-report, on profitability – Return on Assets - ROA, compared with competitors. Profitability on organisational characteristics: SBU autonomy, market orientation, human resources emphasis and relative cost.	Cluster, regression analysis, ANOVA and multiple comparison tests	Prospectors were positively associated with strong market orientation-new product developments, and autonomy. Analysers had significant market orientation, and cost advantages over Prospectors. Defenders were embedded in pursuing low costs. Innovations were positively associated with profitability and negatively with market growth, especially in uncertain markets. There was a strong relationship between low relative cost and profitability.	Supported the typology

	most important to Defenders.					
James and Hatten (1995)	The convergent validity of the self-typing paragraph approach to identify strategy types, on variables that reflect market and risk postures. Covered: Defenders, Prospectors, and Analysers	299 firms in the Banks industry in U.S. large firms Business level Realised Strategy Longitudinal study	Perceptual and archival data were collected. Strategy types: Self-typing paragraph approach questionnaire to CEOs. They were asked to identify which of the four unlabeled paragraphs best described the bank's strategy from 1982-1987. Secondary data (1982-87) was taken from the 1000 largest banks. Convergent validity: variables and their variances were measured over a 5-year span: average net interest spread; variance in net interest spread; average percentage and variance of nonperforming loans; average and variance leverage.	Discriminant analysis, Chi-square	Variables reflecting different market postures predicted different strategy types. Their findings support Shortell and Zajac on convergent validity of self-typing paragraph approach to identify strategy types. The scale – the self-typing paragraph approach - performed quite well in different industries, and revealed to be quite a good measure of strategy types. Defenders and Analysers took less financial risk than Prospectors.	Validation of the typology
Thomas and Ramaswamy (1996)	The alignment of leadership on organisational strategy (administrative problem) and its performance. Covered: Defenders, and Prospectors ***H1*** *- top mangers of Prospectors and Defenders will have distinctly different profiles or skills and attributes.* ***H1a*** *- the top managers of Prospectors are more likely to have backgrounds in output functions than the top mangers of Defenders.* ***H1b*** *- the top managers of Defenders are more likely to have backgrounds in throughput functions than the top mangers of Prospectors.* ***H1c****- the top managers of Defenders are more likely to be promoted from within the organisation than the top managers of Prospectors.* ***H1d****- the top managers of Prospectors will have shorter tenures in the company* than the top mangers of Defenders. ***H1e****- the top managers of Prospectors will be younger than the top mangers of Defenders.* ***H1f****- the top managers of Prospectors will have higher levels of education than the top managers of Defenders* ***H2****- Prospectors and Defenders that are able to achieve an alignment between the characteristics of their top mangers and the requirements of their strategies will perform significantly better than their counterparts that do not achieve such alignment.*	Annual and 10K reports, trade publications, COMPUSTAT II tapes 82 electronics, chemical and petroleum refining industries Large firms Business level Realised strategy Cross-sectional study	Secondary data Strategy: marketing, Research and Development and production expenditure and asset intensity (ration of total assets per employee) Managerial characteristics: age, tenure, level of education, functional background, origin Performance: Return on sales –ROS; Return on assets - ROA; Return on equity-ROE Contextual factor: firm age, firm size and industry membership	Cluster, variance, and regression analysis. Student's t-tests, Chi-square tests. ANOVA, multiple linear regression	Organisational' leaders influence performance outcomes. Their findings validated the administrative dimension of Miles and Snow's typology	

	***H2**-the alignment between top mangers and strategic orientation will explain a greater proportion of variance in performance than organisational age, size or industry membership.*					
Gomes (1998)	Strategy types	Four companies, one in the domestic appliances, and three in the mould industry Small, medium and large firms Corporate level Realised strategy Cross-sectional study	Strategy types: conceptually developed by a post-hoc identification. Not acknowledged the measures used. The conclusions allow an assumption of technology and market-product developments.		One associated firm to the Defender strategy type, three alike pursuing the Analyser strategy type.	Identification of the strategy types

Appendix 2

The Environmental Context of the Portuguese Mould Industry

Appendix 2A - The Portuguese Map

The two main mould industry centres are located in Marinha Grande and Oliveira de Azeméis, which are at 150 Km and 250 Km from Lisbon to the North, respectively. Marinha Grande belongs to Leiria district and Oliveira de Azeméis to Aveiro district.

Appendix 2B - The history of the Portuguese mould industry

Appendix 2B1 - The history of the glass industry

Was the Englishman Guilherme[1] Stephens, managing his lime furnace in Alcântara (Lisbon), when was called to the court and invited by the Portuguese King, Don José I to restart a glass factory in Marinha Grande that had belonged to the Irish John Beare[2]. After two years of hesitations and fears, as it was well known the destiny of the glass factories[3], Guilherme Stephens by expressed wish of the sovereign, which has promised him all the help and protection needed, accepted the invitation (Barros, 1969).

Guilherme Stephens dies in 1803. His brother, João[4] Diogo Stephens succeeds him until 1829, data in which he dies, and leaves the factory to the Portuguese government. At the time, 500 people were working in the factory (Barros, 1969). After the brother's Stephens death the "Real Fábrica de Vidros" (the glass royal factory), designated now as the "Fábrica Nacional / FEIS – Fábrica Escola dos Irmãos Stephens"(National factory – The School Factory of the Stephen's brothers), went through unstable and difficult times, with managers succeeding one to another. Among them it is important to acknowledge the role of Eng. Acácio Calazans Duarte, which managed the National factory for 50 years, between 1924-1970, and that later establishes his own mould firm.

[1] Guilherme is the Portuguese translation for Williams and was the name that was called to the Englishman.
[3] John Beare introduced the glass industry in Marinha Grande, see the newspaper, *Jornal da Marinha*, 26.01.1978; 29.02.1966 and 09.12.1983. The Irish shuts down his "Coina factory" in Lisbon as a result of difficulties in gathering fuel to the furnace, and moves to Marinha Grande. In order to melt down the glass raw material, it was required that the furnaces achieved very high temperatures, and therefore abundance of firewood as fuel for the furnaces was very important. The proximity of the Leiria pine forest to Marinha Grande solved this problem. Additionally, sand was another glass raw material required to the glass production, and was fairly abundant due to the closeness of Marinha Grande to the see. However, the local population was unhappy by the way that Beare was exploring the pine forest, which led to the factory cease (Mendes, 1993).
[3] the Coina factory established by D. João V, and managed by John Beare, shut down, as well as the factory in Covo, Ribatejo and in Lisbon (see the newspaper *Jornal da Marinha*, 26.01.1978; 29.02.1966 and 09.12.1983).
[4] João is the Portuguese translation for John

The National factory had been the birthplace of the manufacturing mould industry. With the exception of Mr. "Belchior" that produced glass moulds for bottles, until 1920 there was no production of glass moulds in Marinha Grande. The moulds were produced in Lisbon, Figueira da Foz, and abroad, namely in Germany and Austria (Beltrão, 1985). As the Eng. Acácio Calazans Duarte stated: "When I came to the National factory, in 1924, the lock-smith services were run by a very young man, called Aires Roque. One day he enquired me and said that the glass moulds used in the factory were being imported, which made them too expensive and their delivery too long. He then suggested me that they could be manufactured in the factory"[5]. Consequently, a mould workshop was established in the factory and in 1925/1926, Mr Aires Roque produced the first die casting mould for glass[6].

With the appearance of the *bakelite* has open the production for other type of moulds. Plastic firms such as "Nobre & Silva" and "Baquelite Lis" (in Leiria), "Hercules" and "Luso-Celuloide in Espinho (Oporto) , and "Patria", "Xavi" and "Valverde" in Guimarães (North) seemed a potential customer for plastic moulds and an interesting alternative to the glass mould production. According to A.H. Abrantes[7]: "the moulds for bakelite have widely developed during the Second World War and I was strongly interested in this technique, I have abandoned the production of moulds for glass to dedicate totally to the production of moulds for plastics, which I could foresee a brilliant future. I have made the first mould for plastics around 1937". In 1935 the *Nobre & Silva*, ordered to Aníbal H. Abrantes, and his brother, the first plastic mould; in 1937, a mould for a plastic lid was produced.

In 1936, as Oliveira de Azeméis was another important glass centre, Mr. António Santos, opened for Aires Roque in Oliveira de Azeméis, the first mould workshop for press glass in this region[8]. However, in 29th March 1950, the partnership was dissolved. Mr. António Santos would be the

[5] Acácio Calazans Duarte, "A indústria de moldes na Marinha Grande" (the mould industry in Marinha Grande), in the newspaper *Jornal da Marinha Grande*, 01.08.1969.
[6] Other moulds have been produced before in Leiria by a blacksmith call José Marques, which is nickname was stick eye
[7] Anibal H. Abrantes in an interview to the newspaper "*O correio de Azeméis*", Nº2777, June, 1981
[8] Anibal H. Abrantes in an interview to the newspaper "*O correio de Azeméis*", Nº2777, June, 1981

only partner of this ownership and the first mould for the plastic industry in Oliveira de Azeméis would be made by him.

Appendix 2B2 - The Aníbal H. Abrantes, Technology, Employees' qualifications and trading policy

The equipment used to make the moulds in the beginning of the industry, were the file, the lathe, and the machines to drill. The drill was endeavoured by a gas motor and the apprentices had the task to light the generator. The training was made at the work place and the apprentices were passing by the different specialised tasks, with the most skilled ending up working at the drawing and at the finishing, polishing sections. This training process took long time, but remained in its essence until the middle of the 1980's (Henrique Neto, in Silva, 1996).

At this time, the qualification of the employees, managers or owners was very basic; in some cases they just had the primary school. According to Henrique Neto (see Silva, 1996), the workforce was specialised in one task, contrarily to what was happening abroad where workers were polyvalent. The mould industry in other countries has derived from the metallurgy and metalworking industries such as high precision, special tools or die-casting. In Portugal there was not such industries tradition, and therefore Aníbal H. Abrantes to overcome the lack of skills in the mould industry has divided the work of the traditional toolmakers, in several tasks or operations, such as milling, turning, polishing, and so on. This work specialisation has allowed a quicker growth of the Portuguese industry and larger firms' dimensions (in terms of the number of employees) than in other countries. This evolution was possible, because it was easier and quicker to train employees in one specific area than to teach them everything.

Only at the end of the 1940s, beginning of the 1950's the workforce started to be admitted with some qualifications, such as the industrial glass course of the Industrial School of Marinha Grande. There was no technical knowledge about machine drawing, which was important for the production of moulds, therefore was asked to the school to run a machine drawing module; as most of the students that were attending to the glass course would like to work within the mould industry. The first people to came out with the industrial course (e.g. Henrique Neto and Lenine

Alexandre) had a significant role in the evolution of the industry, as they have developed the drawing project for the mould. The mould should be shaped in its different phases of the manufacturing process according to the drawing project. The draw standardizes communication between the different sections of the firm, leading towards the production of quality moulds.

Mr. Aníbal H. Abrantes, in order to produce the moulds for its customers and to know what was being produced overseas, besides de fact that he could not speak English, used to visit international European fairs of machinery, tools and plastics that started to emerge at the time, as well as mould manufacturing firms. He used to travel to Spain, France, Belgian, Holland, England, Italy and Germany searching for new products, and bringing with him samples of plastic products, mainly toys and domestic utilities, which he thought that could be adapted to the Portuguese market and therefore of interest to the Portuguese plastic firms. By doing so, he was influencing, determining his customer's plastic products, and consequently securing his own production of plastic moulds[9]. The prices were only established after the mould has been delivered, and customers used to advance money towards the mould production.

Appendix 2B3 - The beginning of the exports

Toni Jongenelen, according to Henrique Neto (see Silva, 1996), was an exceptional man, with extraordinary characteristics. He had been a CIA agent in the Second Word War, in Germany, working as a Jazz player in a music orchestra. When the war finished, the Americans as an act of gratitude facilitate him the scrap and the petrol business. However, the business went wrong and Jongenelen end up working for a Swedish music instruments company. Almost all the other members of the music orchestra went to America and were linked to the plastics business, which was the stylish and modern industry after the war; they were producing toy music instruments. Were the connections with the old orchestra colleagues that allowed him to know that there was a shortage production of moulds for plastics, and therefore that there was an opportunity to do business.

[9] Anibal H. Abrantes in an interview to the newspaper "*o correio de Azeméis"*, Nº2777, June, 1981

Jongenelen's connections enabled him also to know what will be the trend of the Escudo/USA dollar exchange rate and therefore, to establish the exchange rate that most favoured him on the contract that he was celebrating with Aníbal H. Abrantes. It is important to acknowledge that a mould can take long (more than one year) to be manufactured, and if the exchange rate decreases substantially during that time, the manufacturer loses money. As a result, in the beginning of the 60s, Aníbal H. Abrantes was almost in bankruptcy and Jongenelen millionaire, which has led to a conflict between both.

In 1962/63 on one of the disagreements between Jongenelen, and Aníbal H. Abrantes, the later gets seriously sick. The factory careless of work, and both, Jongenelen and Aníbal H. Abrantes decide to send Henrique Neto (Aníbal H. Abrantes's employee) to a USA customer, being the trip paid by Jongenelen, as a result of the serious economic difficulties that the company was going through. The American customer ordered 28 moulds, but acknowledging the economic difficulties of the Aníbal H. Abrantes, and concerned with the accomplishment of the moulds delivery, constrained the order to payment conditions; paying along the moulds manufacturing process and according to a *progress report* (normally the payments are split in three: 1/3 with the order; 1/3 with the mould samples, and 1/3 with the mould delivery). This mould order represented more than half of the total sales of the firm, and allowed the company to an economic recover. The order also questioned the intermediary trading role of Jongenelen and its need for the company exports ability.

Other important outcome from this trip was the acknowledgement that the current organisation cost system was insufficient to quote correctly the mould costs, and therefore its price, and other methods urged to be developed. As a result, a cost system was developed by Henrique Neto, which enabled to ascertain the cost of each mould, to rectify and accurate the quote of similar moulds, and to control the different manufacturing phases of the mould. This cost system remains operational in nowadays in its essence. Henrique Neto becomes the executive manager of the Aníbal H. Abrantes, and in 1975 together with J. Menezes acquires the company.

Appendix 2C - The Portuguese mould industry growth

Table 2Ca - Number of new firms, from the beginning of the industry until 1999

Type of Firms	1935-59	1960-69	1970-79	1980-89	1990-99
Manufacturing mould firms	11	10	14	39	6
Steel, Accessories and Components	1		3	2	2
Specialised services		2	3	2	1
Stamping dies and special tooling			2		
Trading (intermediary) mould firms		1	1	7	4
Mould bases			2	1	
Total	12	13	25	51	13

Source: combined sources, *O Molde* magazine and the Directory 98/99, ICEP

Appendix 2C1 - The new established firms from 1944 to the end of the 70th decade

Most of the new firms have resulted of the exit of the most skilled employees from the long-established firms in the industry. From 1944 until the end of the 1970s the industry had a continued growth.

In 1947, Emídio Maria da Silva, leaves the Aníbal H. Abrantes, and establishes his own firm in Marinha Grande (see Emídio Maria da Silva in *O Molde*, Nº3, 1989). He started to produce moulds for glass and in the middle of the 1950s, moulds for plastics. In the same year, in Oporto, Ernesto S. Simão, establishes his moulding company (see Ernesto S. Simão in *O Molde*, Nº9, 1990).

In 1950 Edilásio Carreira da Silva establishes his company in Marinha Grande (see Directory 98/99-ICEP). In 1955 Lúcio Rodrigues leaves Aníbal H. Abrantes and with Joaquim Landeau and establish the Moldoplástico in Oliveira de Azeméis (see Lúcio Rodrigues in *O Molde*, Nº2, 1988). One year later, in 1956, the Eng. Calazans Duarte, establishes the Moldemega, which is subsequently designated as Calazans, and as INAMOL in 1976 (see Fernando Neto de Almeida in *O Molde*, Nº7, 1990). Two years later, in 1958, a group of skilled workers leave the Aníbal H.

Abrantes and found the Somema in Marinha Grande (see, Américo Silva in *O Molde* Nº5, 1989). In 1959, José dos Santos Ruivo[10] establishes his company in Leiria (see *O Molde*, Nº0, 1988). One year latter, in 1959, António Rodrigues leaves the Modoplástico and establishes his own company, the Simoldes Aços in Oliveira de Azeméis (see António Rodrigues *in O Molde*, Nº6, 1989). The Simoldes Aços is one of the largest and most innovative firms in the industry[11]. In the same year, i.e. in 1959, more two companies were established, Lismolde in Leiria and Palmolde in Marinha Grande (see Directory 98/99-ICEP).

During this period, 1945-1959, prominent people had also a very important role in the development of the industry, among others it can be distinguished, José Loureiro Filipe, João Marques Policarpo, José Marques de Aquino, Joaquim Manuel Paour, Armando da Silva Ruivaço and Albino Rodrigues de Pinho[12].

The sector continued to grow, and in the 60s and the 70s most of the moulding companies have continued to be established by the same way. As stated by Armindo de Pinho e Silva, "was fashionable at that time to establish our own firm" (see *O Molde* Nº4, p:47, 1989).

Between 1935 and the end of 50th decade, the industry had about 12 moulding firms, being 11 manufacturing mould firms, (8 being located around the Marinha Grande region, 2 in Oliveira de Azeméis, and 1 in Oporto), and 1 firm offering Steel, Accessories and Components, located around the region of Oliveira de Azeméis.

In the 60s, more 13 new firms were established, of which, 10 were manufacturing mould firms (7 were established in the region around Marinha Grande, 1 firm in Oliveira de Azeméis, 1 firm in

[10] José dos Santos Ruivo has its training first at Guilherme Stephens factory, and them at Calazans factory, without passing for the well-known "school of the moulds", i.e. the Anibal H. Abrantes firm.
[11] Simoldes Aços, is part of the Simoldes group to which belongs several mould manufacturing and plastic firms. The aim of the group is to give an integrated service to the customer, from the mould project to the assembled plastic pieces, and consequently to add value to the organisation. The Simoldes group has become one of the most influential groups of the Portuguese mould industry, with production in France and Brazil (see *O Molde* Nº29/30, 1996). Simoldes Aços accounted already for 204 employees and has manufactured 4.282 moulds in 1989.

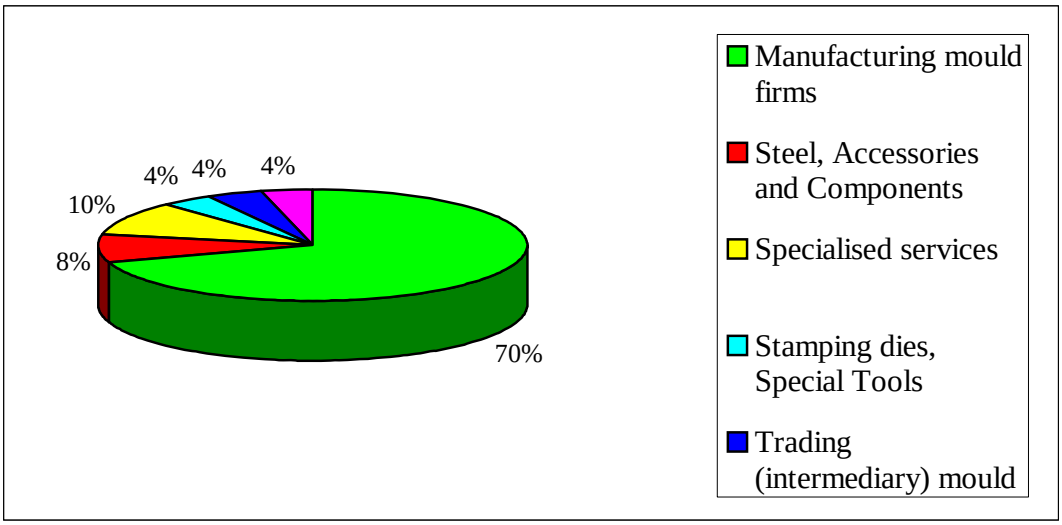
Lisbon and 1 firm in Oporto region). The other three firms were for the first time, one intermediary (located in Marinha Grande) and two specialised services firms (both located in the Oporto region).

In the 70s the sector continued to grow, more 25 new mould firms were created:
-Fourteen manufacturing firms were established: 12 opened around the Marinha Grande region and 2 in Oliveira de Azeméis region. With the exception of the Intermolde firm, which was manufacturing moulds only for glass, all the others were manufacturing mainly moulds for plastics;
-Three were dealing with steel, accessories and components and all were located around Marinha Grande region;
-Three were offering specialised services; and all were located in Marinha Grande;
-Two were specialised in stamping dies and special tooling and both were located in Lisbon;
- Two were specialised in mould bases and both were located in Marinha Grande, and
- One was a trading (intermediary) mould firm, which was located in Marinha Grande,

Concluding, from 1935 to the end of 70th decade the mould industry has accounted for 50 firms, 35 manufacturing mould firms, 5 specialised services firms, 4 steel, accessories and components firms, 2 stamping dies, special tools firms, 2 trading (intermediary) mould firms, and 2 producing mould bases (see Figure 2C1a). From the 50 firms, 37 were located around the region of Marinha Grande, 6 were located in Oliveira de Azeméis, 3 were located in Lisbon and 4 were located in Oporto, (see Figure 2C1b).

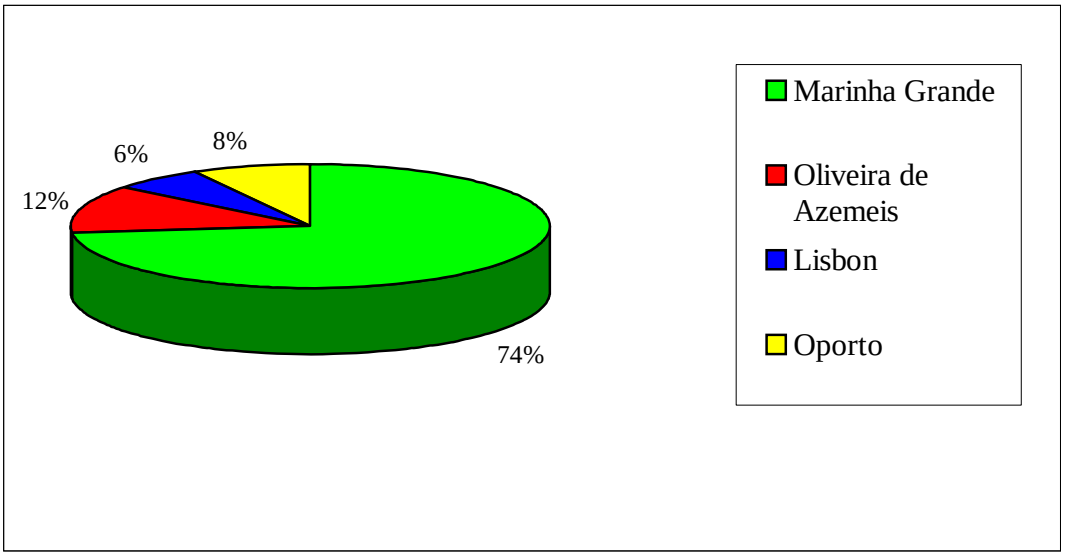
[12] See "Uma indústria que honra o nosso País" (A industry that honors our country) in *Jornal da Marinha Grande,* 07.09.1963

Figure 2C1a - The mould industry, number of firms, 1935-79



Source: combined sources, *O Molde* magazine and the Directory 98/99 ICEP, CEFAMOL

Figure 2C1b - The mould industry, geographic distribution, 1935-79



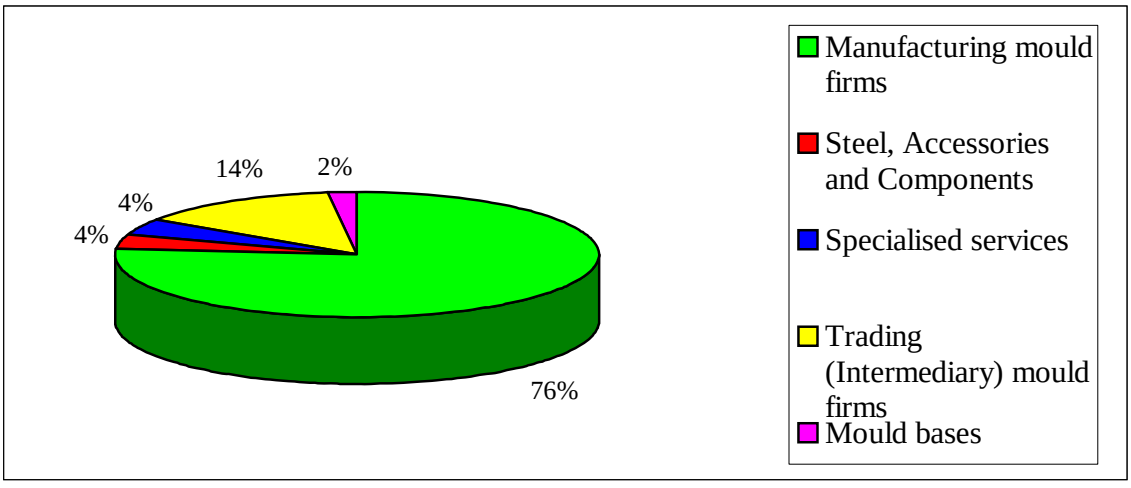
Source: combined sources, *O Molde* magazine and the Directory 98/99 ICEP, CEFAMOL

Appendix 2C2 - The 80s

In the 1980s the industry has boomed. In 44 years (during 1935-79) 50 new firms were established, and in only 10 years i.e. from 1980-89, 51 new firms opened their units, of which:
-Thirty-nine were manufacturing firms: 32 opened around the Marinha Grande region, 4 in Oliveira de Azeméis region, and 3 in the Oporto region. From those only one firm was manufacturing moulds for glass; all the others were manufacturing mainly moulds for plastics;
-Two were dealing with steel, accessories and components and both were located around Marinha Grande region;
-Two were offering specialised services, mainly design engineering and were both located in Marinha Grande;
- One was specialised in mould bases and were located in Marinha Grande, and,
- Seven were trading (intermediary) mould firms, 5 were located in Marinha Grande, 1 in Oliveira de Azeméis and 1 in Oporto.

Concluding, from those 51 new firms, 76% were manufacturing firms, 14% were trading (intermediary) firms, 4% were steel accessories and components, 4% were specialised services, such as design and engineering and 2% were mould base firms (see Figure 2C2a).

Figure 2C2a - The mould industry, number of firms, 1980-89



Source: Directory 98/99 ICEP, CEFAMOL

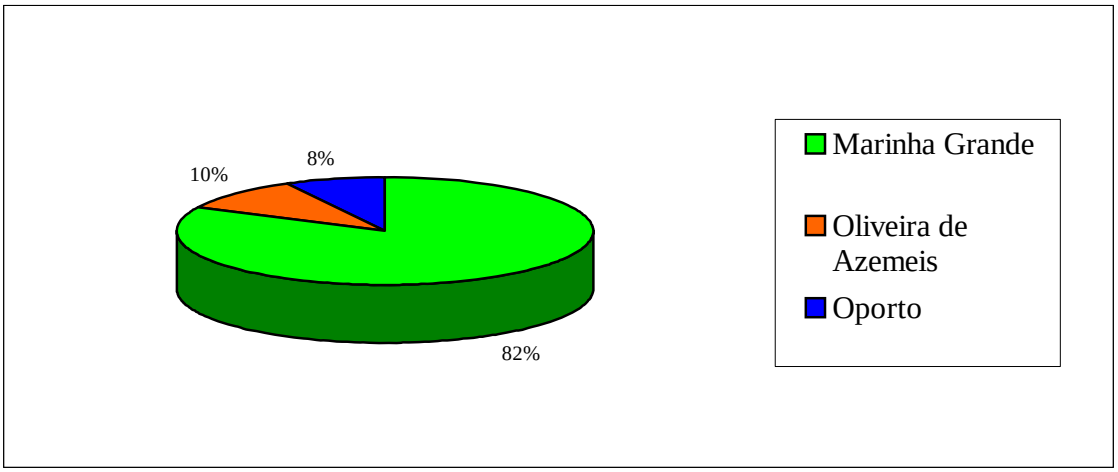
In this growth, was also significant, the number of new trading (intermediary) firms, which had moved from 2 (in the 60s and 70s) to 7 firms. This resulted of a generalised lack of international business and marketing knowledge, as well as foreign language domain. To do business internationally is necessary at least to: i) speak English fluently, ii) have a perfect understanding of the mould manufacturing process in order to correctly quote the moulds and iii) comprehend the international trade legislation to secure the moulds payment. Most of managers that have established their own firms came from different phases or sections of the mould manufacturing process (in which they were really good at), and consequently, they had little knowledge of international business. Therefore, most of the manufacturing mould firms become dependent on national and international trading mould firms to export. So as the manufacturing mould firms were being established, trading (intermediary) firms were necessary. The success of "Tecmoldes" and "Iberomoldes" trade firms in the 60s and 70s has also encouraged new entrants, and the 80s are consequentially a reflection of that.

Trading (intermediary) firms have an important role in the internationalisation of the mould industry. However, some mould manufacturing managers felt that trading (intermediary) firms explore them, squeeze their profit margins to the limit, while yield considerable margins from their international customers. As they use to argue, trading (intermediary) firms have the profit, and the manufacturing firms are left with all the hard work (e.g. heavy investments on technology and training to sustain competitiveness). As a result, some firms tend to gradually look for their own customers, and do business directly.

The geographic distribution of the new established moulding firms in the 80s, was similar to that previously followed for the period 1935-1979. The surrounded region of Marinha Grande[13] led the geographic choice of managers to open their firms, accounting for 80%. The second region most chosen was Oliveira de Azeméis, accounting for 12% of the managers' preferences (see Figure 2C2b). Oporto was the last managers' choice to open moulding firms and related business, i.e. 8%.

[13] in order to simply the analyses and due its geographic proximity, the surrounded area of Marinha Grande includes firms located in Leiria.

Figure 2C2b - The mould industry, geographic distribution 1980-89



Source: Directory 98/99 ICEP, CEFAMOL

Appendix 2C3 - The 90s

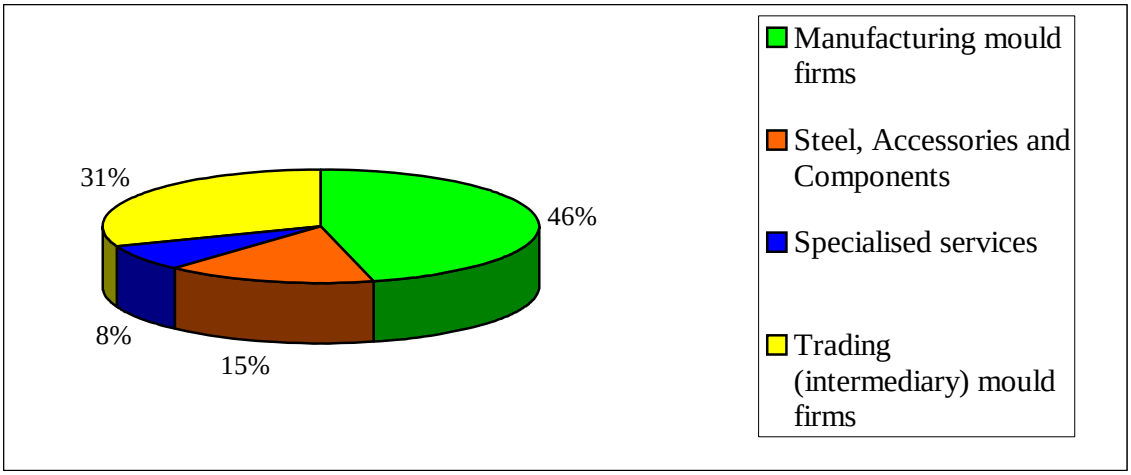
After the boom of the 80s, the sector slowed down. According to the Directory 98/99 ICEP and CEFAMOL, in the 90s more 13 new firms were established. From those:

- Six were manufacturing firms, 2 located in Marinha Grande and 4 in Oliveira de Azeméis. From those, only one firm was producing moulds for glass; all the others were mainly producing moulds for plastics.
- Two were offering steel, accessories and components, with one being located in Marinha Grande and the other in Oporto.
- One was offering specialised services in design and engineering, and was located in Marinha Grande, and
- Four were trading (intermediary) firms, 3 located in Marinha Grande, and one in Lisbon.

The number of manufacturing firms is still dominant in the 90s, however is much lower than in the 1980s, decreasing from 76% to 46% (see Figure 2C3a). Manufacturing firms are followed by trading (intermediary) with 31%. The number of new trading (intermediary) mould firms established in the 1990s may contradicts the trend that firms are strengthening their marketing

and trading position, and therefore relying on themselves to explore their own new customers and markets. However, only the larger and medium seized manufacturing firms have the financial capacity to allocate resources for the developing and reinforcement of commercial-trade departments. These departments require people with qualifications to do business internationally and financial support to backup overseas trips that not always produce immediate successful results. The number of new established trading (intermediary) firms therefore, leads us to the conclusion that there may be an important number of micro and small firms in the market place. Micro and small firms lack of people with specialised skills and financial resources to explore their own markets; to look abroad for their own customers, thus are dependent on trading (intermediary) firms to export. Is suggested that trading (intermediary) mould firms have high profit margins, high returns, with no need for heavy technological investments as manufacturing firms do. As a result, individuals see a potential opportunity for making money quickly, which justifies its continued growth.

Figure 2C3a - The mould industry, number of firms 1990-99

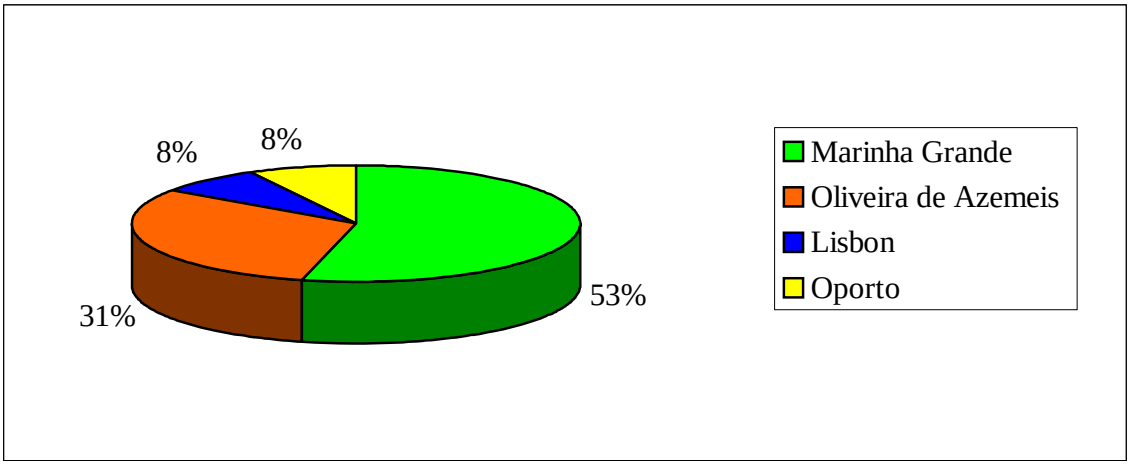


Source: Directory 98/99 ICEP, CEFAMOL

Related to the geographic distribution, Marinha Grande still leads the geographic choice of managers to open their units, accounting for 53% of the established firms. Marinha Grande is followed by Oliveira Azeméis with 30% (see Figure 2C3b). However, the number of new firms located in Marinha Grande decreased, moving from 82% in the 80s to 53% in the 90s. Contrarily,

the number of new firms in Oliveira de Azeméis increased from the 80s to the 90s, accounting for 10%, and 31%, respectively.

Figure 2C3b - The mould industry, geographic distribution 1990-99



Source: Directory 98/99-ICEP, CEFAMOL

A possible explanation for the quick growth of the Portuguese mould industry could be underlined on the fact that the exports have began in the earl stages of the development of the industry, and on the development of a specialised work. Contrarily to what happened in other countries, in Portugal there was no tradition in the metal-mechanic industry. Thus, to learn how to produce moulds, employees start to specialise their knowledge on the different phases of the manufacturing process (specialised work). It was easier, and took less time to learn how to do well one task of the manufacturing process, than all. The Portuguese workers became experts in each task or phase of the manufacturing process. This allowed that specialised work spread quickly, and consequently has potential the development of new firms This also implied an easier acceptance and adaptation to the most sophisticate technologies (Neto, 1999).

The industry growth analysis was based on the *O Molde* magazine and the 98/99-ICEP, CEFAMOL, directory. Tables 2C3a, 2C3b and 2C3c illustrate the firms that accounted for the analysis.

Table 2C3a - The Portuguese mould firms established between 1935-1979

Established in	Firm	Owner /Manager	Main Activity	Locality	References
1935*	Ramada	Orlando ramada	Steel, Accessories and Components	Ovar, Oliveira de Azeméis	O Molde, Nº39, 1999
1944	Anibal H. Abrantes	Anibal H. Abrantes	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº15, 1992
1947	Emídio Maria da Silva	Emídio Maria da Silva	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº3, 1989
1947	Ernesto S. Simão	Ernesto S. Simão	Manufacturing moulds for plastics	Maia , Oporto	*O Molde*, Nº9, 1990
1950	Edilásio Carreira da Silva	Edilásio Carreira da Silva	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1955	Moldoplástico	Lúcio Rodrigues and Joaquim Landeau	Manufacturing moulds for plastics	Oliveira de Azeméis	O Molde, Nº2, 1988
1956	Moldemega – Calazans -INAMOL	Calazans Duarte, Fernando Almeida	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº7, 1990
1958	Somema	Fernando Vicente,	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1959	José dos Santos Ruivo	José dos Santos Ruivo	Manufacturing moulds for plastics	Marinha Grande	*O Molde*, Nº0, 1988
1959	Lismolde	Rafael Ruivo	Manufacturing moulds for plastics	Leiria	Directory 98/99-ICEP, CEFAMOL
1959	Palmolde	José Duarte	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1959	Simoldes Aços	António Rodrigues	Manufacturing moulds for plastics	Oliveira de Azeméis	O Molde, Nº6, 1989
1960-69					
1962	Soarmoldes	Jorge Soares, Joaquim Soares, António Gomes	Manufacturing moulds for plastics	Oporto	Directory 98/99-ICEP, CEFAMOL
1963	Pinhos & Ribeiro	Armando Pinho e Silva	Manufacturing moulds for plastics	Oliveira de Azeméis	O Molde, Nº4, 1989
1965	Mesil	Manuel A. Duarte	Manufacturing moulds for plastics	Leiria	Directory 98/99-ICEP, CEFAMOL
1965	Somoplaste	Americo Silva	Manufacturing moulds for plastics	Alcobaça, Leiria	*O Molde*, Nº5, 1989
1965	Irmãos Gomes	Luís Gomes	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1965	Rigor	Pina, Goncalves, Elias	Manufacturing moulds for plastics	Lisbon	Directory 98/99-ICEP, CEFAMOL
1968	AFA	Ângelo Fernandes	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1968	Marimoldes	Fernando Anunciação	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1968	Molde Matos	Arnaldo Matos,	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1968	Novateca	António Bárido	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1968	Tecmolde	António Santos	Trading (intermediary) mould firm	Marinha Grande	O Molde, Nº16, 1992
1969	Roehlen Martin	F. Matos	Specialised services:Testing, texturising and engraving moulds	Oporto	Directory 98/99-ICEP, CEFAMOL
1969	Mold-Tech Portugal	Francisco Matos	Specialised services: texturising	Maia, Oporto	Directory 98/99-ICEP, CEFAMOL
1970-79					
1970	Irmaos Melo	Fernando Melo, António Melo	Manufacturing moulds for plastics	Oliveira de Azeméis	Directory 98/99-ICEP, CEFAMOL
1971	Entamoldes	Pedro Santos, Fernando João	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL

1971	Famopla	José Costa	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1971	Tecnimoplás	Amadeu Carlos, António Marrazes	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº11, 1991
1973	A Rigorosa	José Paulino	Stamping dies, Special Tooling	Lisbon	O Molde, Nº19, 1993
1973	Intermolde	José Ferreira, Júlio Ferreira	Manufacturing moulds for glass	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1974	Tecnisata	José Filipe	Stamping dies, Special Tooling	Lisbon	Directory 98/99-ICEP, CEFAMOL
1975	IBEL-Irmãos Bernardes	Joaquim Bernardes	Manufacturing moulds for plastics	Oliveira de Azeméis	Directory 98/99-ICEP, CEFAMOL
1975	Iberomoldes	Henrique Neto, Joaquim Menezes	Trading (intermediary) mould firm	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1975	Geco	António Febra	Manufacturing moulds for plastics	Maceira Liz , Leiria	Directory 98/99-ICEP, CEFAMOL
1975	Favimolde	Luís Abreu	Manufacturing moulds for plastics and glass	Marinha Grande	The firm catalogue
1975	SET	Henrique Neto	Specialised services: Design, engineering	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1977	Celectro	Eduardo Borrego	Specialised services: Electrode design	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1977	Moldebase	António Natario	Molde bases	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1977	Thyssen Aços Finos	Domingos Granja	Steel, Accessories and Components	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1978	Cemafre	Avelino Santos	Specialised services: Milling services	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1978	Iberonorma	José Eusébio	Mould bases	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1978	Planimolde	Fernando Pedro, Telmo Ferraz, Arnaldo Matias	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº31, 1997
1978	Portumolde	Joaquim Marques, Joaquim Carreira	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1978	Sorep	Fernando Ruivo	Steel, Accessories and Components	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1979	Inpomoldes	Fernando Matias, Manuel Ribeiro	Manufacturing moulds for plastics	Batalha, Leiria	Directory 98/99-ICEP, CEFAMOL
1979	Molingec	António Filipe	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1979	Rerom	Adriano Caseiro, João Caseiro	Steel, Accessories and Components	Leiria	Directory 98/99-ICEP, CEFAMOL
1979	Somoltec	Agostinho Febra, Amadeu Neto	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº17, 1992
1979	Socem, M.S.	Luís Febra	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL

***** Ramada was serving the glass industry, and with the appearance of the bakelite started to serve the plastic mould industry, therefore was considered in the analysis.

Note: Marinha Grande belongs to Leiria district, however as the industry has born in Marinha Grande, all the firms located in Leiria were analysed as located in Marinha Grande (which is 12 km way from Leiria).

Table 2C3b - The new Portuguese mould firms established between 1980-1989

1980-89

1980	Costa & Rocha	Rocha	Manufacturing moulds for plastics	Oliveira de Azeméis	Directory 98/99-ICEP, CEFAMOL
1980	Imoplástic	João Moita	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1980	Moldes Lecomema	Carlos Fonseca	Manufacturing moulds for plastics	Maceira Liz, Leiria	Directory 98/99-ICEP, CEFAMOL
1981	Cepmolde	Carlos Fernandes	Specialised services: Design, engineering	Maceira Liz, Leiria	Directory 98/99-ICEP, CEFAMOL
1981	Famplac Moldes, Lda.	João faria	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº23, 1994
1981	Moldes Catarino	João Catarino	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1982	Almamolde	Júlio Guedes	Manufacturing moulds for plastics	Oliveira de Azeméis	O Molde, Nº12, 1991
1982	Camarinha & Brandão	Manuel Camarinha, José Brandão	Manufacturing moulds for plastics	Valadares, Oporto	Directory 98/99-ICEP, CEFAMOL
1982	Helmaplás	Fernando Heleno	Trading (intermediary) mould firm	Maceira Liz, Leiria	Directory 98/99-ICEP, CEFAMOL
1982	Manuel E. Miranda	Manuel Miranda	Trading (intermediary) mould firm	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1982	Mecamolde	Cipriano Bastos	Manufacturing moulds for plastics	Oliveira de Azeméis	Directory 98/99-ICEP, CEFAMOL
1982	Moldiber	Manuel Henriques	Manufacturing moulds for plastics	Maceira Liz, Leiria	Directory 98/99-ICEP, CEFAMOL
1982	Rosagui	Alcino Rosa	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1982	Transmolde	Mário Silva	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1983	LN moldes	Leonel Gomes	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº24, 1994
1983	Moldene	António Pescada	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº25/26, 1994
1983	Mouldexport	Eduardo Pedro	Trading (intermediary) mould firm	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1984	Famolde	Joaquim Martins	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1984	Fipromolde	Leonel Grácio	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1984	JDD	João Pinto	Manufacturing moulds for plastics	Oliveira de Azeméis	O Molde, Nº40, 1999
1984	Plafam	Vitor Ferreira	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1984	Moldegal	Ismael Santos	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1984	Socimoplás	Valdemar matias	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1985	Virmolde	Fernando sebastião	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1985	Duramoldes	António Oliveira	Manufacturing moulds for plastics	Águeda, Oporto	Directory 98/99-ICEP, CEFAMOL
1985	Efemoldes	Maria Lisene Ferreira	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1985	Europlaste	Carlos Ruivo	Trading (intermediary) mould firm	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1985	Ideal Molde	Carlos Salgueiro	Manufacturing moulds for plastics	Maceira Liz, Leiria	O Molde, Nº41, 1999
1985	Moldebase	António Natário	Mould bases	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1985	Somolin	Idalécio Rodrigues	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1985	TJ Moldes	João faustino	Manufacturing moulds for plastics	Marinha Grande	O Molde, Nº22, 1993

1985	Unitecmol	Rafael Ruivo	Manufacturing moulds for plastics	Leiria	Directory 98/99-ICEP, CEFAMOL
1985	Vidrimolde	Martins Ferreira	Manufacturing moulds for glass	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1986	Celmex	Fernando Santos	Manufacturing moulds for plastics	Maceira Liz, Leiria	Directory 98/99-ICEP, CEFAMOL
1986	Cemo	Arnaldo ramos	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1986	Lusomold	Mário Pereira	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1986	Rabourdin Portugal, Lda	Acácio Filipe	Steel, Accessories and Components	Marinha Grande	O Molde, Nº21, 1993
1986	Socem	Luís Febra	Manufacturing moulds for plastics	Maceira Liz, Leiria	O Molde, Nº27, 1995
1987	Azemoldes	Armindo Soares	Manufacturing moulds for plastics	Oliveira de Azeméis	Directory 98/99-ICEP, CEFAMOL
1987	Deltamolde	José Guerra	Trading (intermediary) mould firm	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1987	I.T.M.	Artur Duarte	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1987	Famil	Domingos salgado	Manufacturing moulds for plastics	Felgueiras Oporto	Directory 98/99-ICEP, CEFAMOL
1987	Moldegama	Olavo Fernandes	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1988	Moldoeste	Valdemiro Teixiera	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1988	UPM	Armando Batista	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1989	Consumolde	Silva Lopes	Trading (intermediary) mould firm	Oliveira de Azeméis	Directory 98/99-ICEP, CEFAMOL
1989	Hasco portuguesa	Manfred Kosciolek	Steel, Accessories and Components	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1989	Matelcomp	Oliveira Dias	Trading (intermediary) mould firm	Maia, Oporto	Directory 98/99-ICEP, CEFAMOL
1989	Riamolde	Manuel Rodrigues	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1989	Ribermolde	Alberto Ribeiro	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1989	Setsa	Henrique Neto	Specialised services: Design, engineering	Marinha Grande	Directory 98/99-ICEP, CEFAMOL

Table 2C3c - The new Portuguese mould firms established between 1990-1999

1990-99

1990	AMPCO	A. Coimbra	Steel, Accessories and Components	Maia, Oporto	Directory 98/99-ICEP, CEFAMOL
1991	Planitec	Carlos Silva	Manufacturing moulds for plastics	Porto de Mós, Leiria	Directory 98/99-ICEP, CEFAMOL
1991	Eschmann-Stahl Portugal	Cândido Carvalho	Steel, Accessories and Components	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1991	Inova	José Morais	Specialised services: Design, engineering	Marinha Grande	O Molde, Nº33, 1997
1991	Madumolde	Hermenegildo Duarte	Manufacturing moulds for plastics	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1991	M.D.A	Rui Rodrigues	Manufacturing moulds for plastics	Oliveira de Azeméis	Directory 98/99-ICEP, CEFAMOL
1991	Moldit	José Costa	Manufacturing moulds for glass	Oliveira de Azeméis	O Molde, Nº34, 1997
1991	Spem	Álvaro Torre	Trading (intermediary) mould firm	Lisbon	Directory 98/99-ICEP, CEFAMOL
1992	Olesa	Leite Pinto	Manufacturing moulds for plastics	Oliveira de Azeméis	Directory 98/99-ICEP, CEFAMOL
1994	FR CAD	Graça Morgado	Trading (intermediary) mould firm	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1994	On-Time Molde	Manuel Carlos	Trading (intermediary) mould firm	Marinha Grande	Directory 98/99-ICEP, CEFAMOL
1995	IMA	Carlos Seabra	Manufacturing moulds for plastics	Oliveira de Azeméis	Directory 98/99-ICEP, CEFAMOL
1996	MGM	José Manuel Saloio	Trading (intermediary) mould firm	Marinha Grande	Directory 98/99-ICEP, CEFAMOL

The information previously given is based on the CEFAMOL and the ICEP, as it is not easy to obtain governmental statistical data about the mould industry. Before 1992 there was no specific SIC code for the mould production, i.e. there was a sic code for the production of other metallic products no specified. Only in1992 exists a specific SIC code for the production of metallic moulds (see Table 2C3d).

Table 2C3d - SIC code

SIC code- Revision 1 (1973)	SIC code Revision 2 (1992)
381990 - Production of other metallic products no specified	**29563** - Production of metallic moulds

Appendix 2C4 - The nature of the Portuguese mould firms

The definition of a SME has not been homogeneous among researchers, with different definitions resulting from the use of multiplicity criteria in different sectors (see Bolton, 1971, and Curran et al., 1991). The current research uses the European Commission's definition, i.e. SMEs are any firm with less than 500 employees. This definition is broken down into three categories: micro-enterprises employing 0-9 people; small enterprises employing 10-99 people and medium sized enterprises employing 100-499 people. As a result, in the Portuguese mould industry the majority of firms are small sized enterprises, being only few, medium sized firms. So, analysing the Portuguese mould industry means investigating the SME's business strategic behaviour.

SMEs constitute a significant element of modern economies. They play an important role in terms of the number of firms, in terms of their contribution to a country's employment level, or even in the creation of value for the economies. Following the above definition, SMEs represent over 95% of enterprises in most OECD countries, generate a substantial share of GDP and account for well over half of private sector employment. Most governments develop programmes to help SMEs to overcome their difficulties in areas such as financing, technology and innovation, management and exports[14]. Alike in OECD countries, SMEs account for more than 95% of all businesses in Europe[15]. Their commercial activities represent on average, 64% of the annual turnover in the European Union, and they employ 70% (an average Figure) of the total workforce in Europe (Bovis, 1996). In Portugal, 99% of all business falls into this category[16]. Most of the Portuguese mould firms, are SMEs, and they are family run business. SMEs tend to remain small, and their emphasis is on profit rather than market share or sales growth.

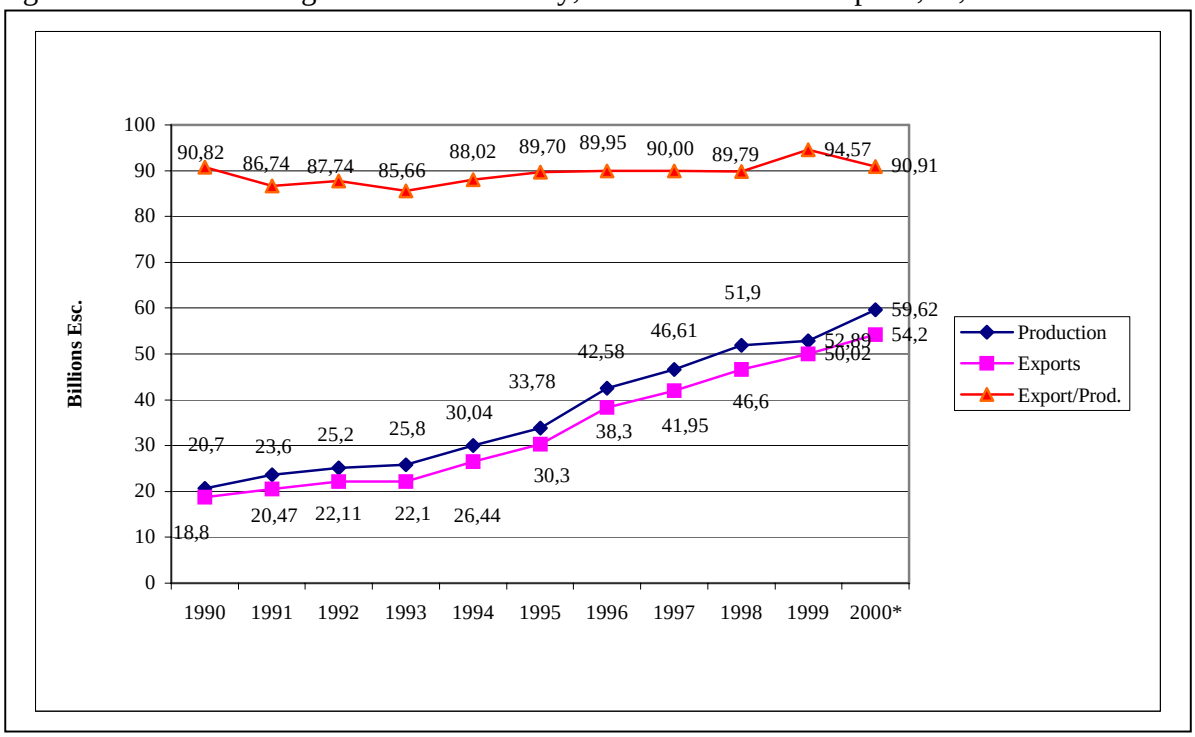
Small and medium sized enterprises are attracting increased attention, in recognition of their economic role and their contribution to growth. Several are the researchers that have studied SME's strategic behaviour (see Oakey, 1984; O' Farrell, 1988; Reid, 1993, and Storey, 1994, among others).

[14] OECD Small and Medium Enterprise Outlook, 2000 edition.
[15] OECD (1997), *Small Business, Job Creation and Growth: Facts, Obstacles and Best Practices*.
[16] Labour Ministry, Statistical department, 1996

Appendix 2C5 - 90% of the Portuguese mould production is for exports

As it can be seen in Figure 2C5a, the Portuguese mould industry for the 90th decade has been exporting on average 90% of its production, registering in 1999 its higher percentage (92,06%).

Figure 2C5a - The Portuguese Mould industry, Production versus Exports, %, 1990-1999



Source: ICEP - Investments, Trade and Tourism of Portugal, and CEFAMOL
* an estimated value.

The high level of mould exports is also a result of a weak national plastic industry. The development of the Portuguese mould industry was, and will continue to be fostered by the overseas plastic firms. Nonetheless, if on one hand the high level of exports is beneficial and generates richness, on another hand the industry becomes extremely dependent on the environmental trends of the countries to which exports.

Appendix 2D - The mould manufacturing process

The mould manufacturing process comprises several tasks, describe as follows:

The mould project (product definition: product design)

Customers may have just a thought of the product that they want, they may have a plastic piece, or they may have a very simple draw. Is necessary therefore, to develop a mould project in order to produce the mould. There are also customers that have a clear idea of the product that they want to produce and based on its specifications, the mould is designed. The design of the mould is perhaps one of the most important phases of the mould production. Most of the mistakes found in the manufactured process are a result of a fault in the mould design. Studies show that design determines 80% of the final production costs (Syan, 1994). The design of a product is a critical activity for business, as has a major influence on the quality and performance of the resulting product (Lee, 1996). The computer aided design (CAD) system is a very important tool in increasing accuracy of the product design (is easier to change and to visualise the designed mould). The PMMF are internationally recognised for their quality in mould design and product engineering (Ogando, 1998). To design the mould is necessary to be an expert in drawing as well as having a deep knowledge of the mould technical aspects (e.g. reactions and durability of the steel and the thermoplastics). The mould design is made with the support of the CAD (computer aided design) and the *mould flow* software. The later simulates the way the plastic flows in the mould, enabling to better understand the internal pressures, the temperature and the time need for the mould to be injected. Design for manufacture (DMF) techniques have also been developed to improve the quality and costs of new products. The power of design manufacture techniques can be increased when involves simultaneously the product design and the mould manufacture process.

The rapid prototyping (product definition: prototyping)

In order to assess the final mould draw there are some firms that are making a rapid prototyping (see Rui Neto, in *O Molde*, Nº39, 1999). This allows mangers to see the product before the mould starts to be manufactured. It enables to detect eventual mistakes, which otherwise would be only possible to identify and emend when the mould is being manufactured. The rapid prototype enables to achieve time-market. The process of the mould project involving the product design, the mould design and the rapid prototyping is generally known as concurrent engineering or simultaneous engineering.

Taking in account the above phases, the first draft of the mould is draw and sent to the customer for approval (it may be that the draw will be subject of some changes). After the first draw has been approved, the final draw is made as well as the draws with detail information of all the mould components: the mould is ready to start to be manufactured.

The machining

The mould manufacturing process starts with the preparation of the steel, and is followed by the construction of the mould base. The mould base may involve finish pockets, ejector pin, screw and connector holes, standard and special accessories, drilling[17], cooling water, and grinding being dependent those prerequisites on the customers' mould requirements. The mould base is subject of a quality control. After the mould base is build the steel is ready to be crafted. Milling, turning and electrode design manufacturing (EDM) [18], are the next phases to be carried out. Milling and EDM are alternatively performed, according to the product design requisites. In general these tasks are currently supported by CNC (Computer Numeric Command) systems, enabling high precision, and continued work. The CNC systems use CAM (Computer Aided Manufacturing) software, allowing the simulations of the machining work, i.e. it permits to

[17] consists in drill the mould in order to allow the liquid circulation inside it

[18] - Milling, consists in take successive steel layers through roughing shreds in order to craft the mould according to the geometric dimensions required.
- Turning, consists in turn the mould in order to obtain cylindrical, conic and spherical shapes by roughing shreds
- Electrode Design Manufacturing - EDM, consists in removing the steel through the electrical discharge. This technology is employed in moulds of complex geometry and of very high precision measures.

simulate which procedures to follow, to mould the steel effectively according to the CAD draws. The programme selects the right tools and the respective sequence of use. When the machine starts, follows the programme instructions, changing automatically the tools needed by the sequence required, with no need of any employee.

Some of these specific phases (e.g. milling and electrode erosion) are subcontracted to specialise services firms, which confers to the industry some management flexibility. Each of the above machining phases is subject of high rigours quality control with the objective to certify that the measurements required are accomplished and to detect possible mistakes. It is important to emphasise that all of the mentioned phases are elaborated according to the draws of the mould.

The next phase that follows is the polishing and finishing. It consists in polish the steel with sandpaper and/or a diamond paste until it looks like a mirror. This is the only way to obtain transparent plastic pieces. It is in this phase that the moulds achieve the required dimensions.

Assembling

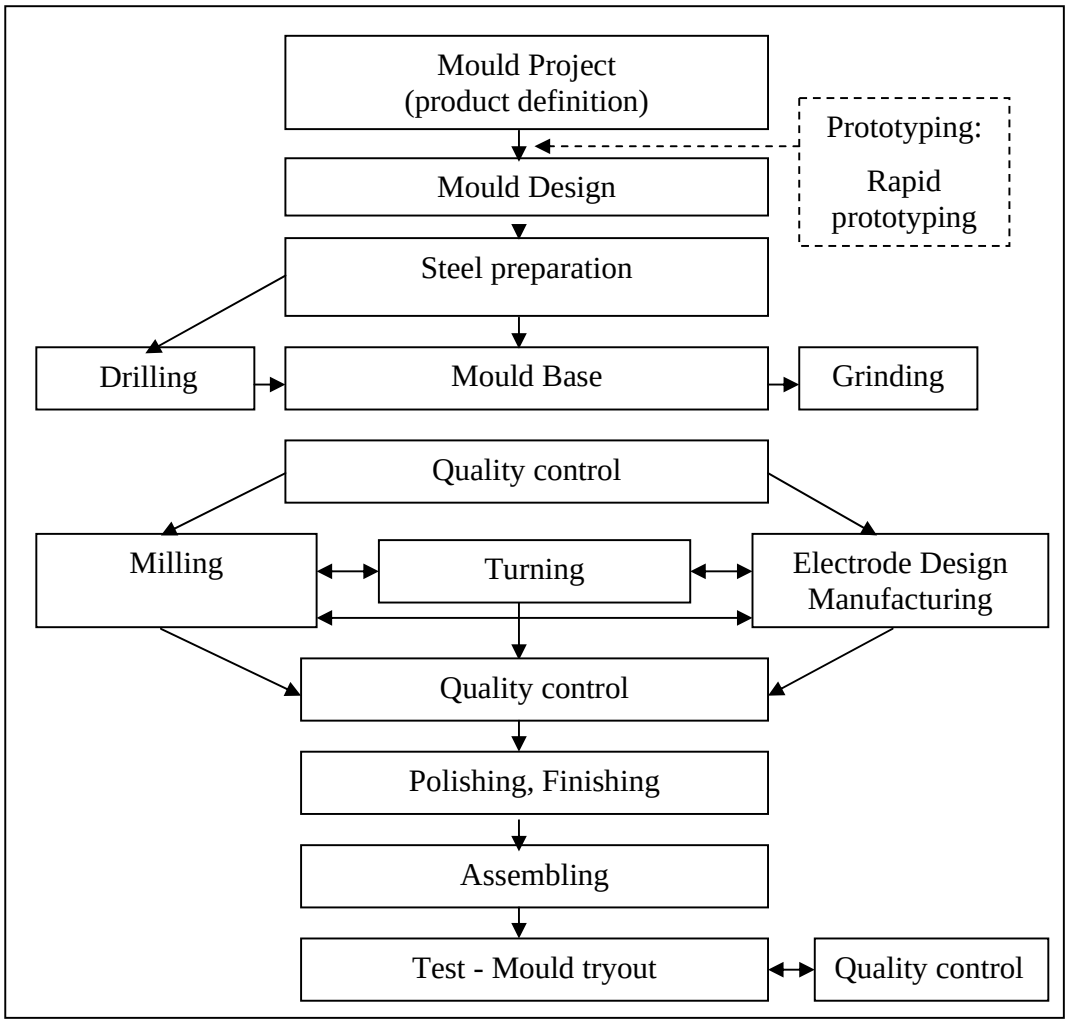
This is the final phase, all the elements that integrate the mould are assembled on the metallic mould base. The mould is then ready to produce the plastic piece required.

The mould tryout and delivery

Once the mould is finished it is necessary to try it out; to test it (e.g. in an injection machine) in order to know whether the mould is working in perfect conditions and whether it manufactures the pieces required by the customer (respecting all the specifications and measures). If everything is working accordingly the mould is delivery.

The manufacturing mould process is illustrated in Figure 2D

Figure 2D - The manufacturing mould process



Appendix 2E - The evolution of the exports, imports, exports by countries and industries served

Appendix 2E1 - The 60s

Table 2E1a - The Portuguese mould industry Exports[19], Imports, and Trade balance, 1960-1969

	84.60. Exports				84.60. Imports				Trade Balance	
Years	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc
1960	41	4.751		116	95	11.976		126	-54	-7.225
1961	71	8.132	71,2%	115	29	5.901	-50,7%	203	42	2.231
1962	150	15.731	93,4%	105	62	9.113	54,4%	147	88	6.618
1963	193	26.212	66,6%	136	43	5.839	-35,9%	136	150	20.373
1964	271	33.174	26,6%	122	58	7.165	22,7%	124	213	26.009
1965	388	49.651	49,7%	128	101	13.453	87,8%	133	287	36.198
1966	322	43.563	-12,3%	135	66	14.492	7,7%	220	256	29.071
1967	350	50.275	15,4%	144	80	11.327	-21,8%	142	270	38.948
1968	468	66.641	32,6%	142	107	13.042	15,1%	122	361	53.599
1969	519	78.534	17,8%	151	96	17.134	31,4%	178	423	61.400
Total	2.773	376.664		136	737	109.442		148	2.036	267.222

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics
Value calculated at current prices
84.60. - is the custom nomenclature code for the mould industry

Table 2E1a shows that the exports for the 60th decade considerably increased, growing at very high growth rates in the beginning of the decade and slowing down after 1966. The imports also increased, however the exports were superior to the imports, resulting in a positive trade balance.

[19] Note: the custom nomenclature code for the moulds exported until the end of the 80s was: 84.60. In the 90s and according to the harmonised system the code has changed to 84.80.

Table 2E1b - The Main Portuguese mould export markets, as % of the Portuguese total mould exports, 1960-1969

Years	USA	UK	West Germany	Canada	Venezuela	Others	PT Mould Exports
1960	37%	22%	1%	10%	2%	28%	100,0%
1961	59%	15%	0%	8%	6%	12%	100,0%
1962	58%	15%	1%	5%	2%	19%	100,0%
1963	54%	14%	3%	7%	2%	20%	100,0%
1964	54%	12%	8%	4%	5%	17%	100,0%
1965	51%	8%	6%	5%	4%	26%	100,0%
1966	58%	8%	5%	3%	4%	22%	100,0%
1967	62%	12%	3%	2%	3%	18%	100,0%
1968	57%	16%	5%	7%	3%	12%	100,0%
1969	59%	16%	5%	3%	2%	15%	100,0%

Source: First Congress of the Portuguese Mould Industry, proceedings, 1985

Table 2E1c - The Portuguese mould exports to the American Continent (AC) and to European Continent (EC) as % of the Portuguese total mould exports, 1960 –1969

Years	AC*	EC	Total = AC + EC
1960	57%	25%	82%
1961	78%	19%	97%
1962	68%	24%	92%
1963	66%	26%	92%
1964	58%	26%	84%
1965	61%	25%	86%
1966	66%	19%	85%
1967	67%	23%	90%
1968	62%	26%	88%
1969	63%	26%	89%

Source: First Congress of the Portuguese Mould Industry, proceedings, 1985
* Includes the USA, Canada, Mexico and Venezuela

Appendix 2E2 - The 70s

Table 2E2a - The Portuguese mould industry Exports, Imports, and Trade balance, 1970-1979

	84.60. Exports				84.60. Imports				Trade Balance	
Years	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc
1970	758	121.458		160	187	25.626		137	572	95.832
1971	827	131.746	8,5%	159	307	43.204	68,6%	141	520	88.542
1972	936	169.320	28,5%	181	546	45.865	6,2%	84	390	123.455
1973	899	179.575	6,1%	200	676	59.264	29,2%	88	222	120.311
1974	978	224.421	25,0%	229	1188	113.045	90,7%	95	-210	111.376
1975	907	274.602	22,4%	303	743	79.912	-29,3%	108	163	194.690
1976	902	289.327	5,4%	321	666	86.795	8,6%	130	236	202.532
1977	1.043	532.015	83,9%	510	459	108.521	25,0%	236	583	423.494
1978	1.289	724.025	36,1%	562	666	190.672	75,7%	286	623	533.353
1979	1.218	1.041.387	43,8%	855	418	320.674	68,2%	766	800	720.713
Total	9.756	3.687.876		3.480	5.857	1.073.578		2.072	3.899	2.614.298

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics
Value calculated at current prices
84.60. - is the custom nomenclature code for the mould industry

As seen in Table 2E2a, besides the international petrol crisis in the being of the decade, the exports continued to increase for 1970-1979. The imports also increased, but much lower than the exports, which implied a positive trade balance.

Table 2E2b - The Main Portuguese mould export markets, as % of the Portuguese total mould exports, 1970 -1979

Years	USA	UK	Total USA+UK
1970	63%	13%	76%
1971	63%	11%	74%
1972	66%	9%	75%
1973	61%	12%	73%
1974	60%	13%	73%
1975	46%	10%	56%
1976	44%	11%	55%
1977	48%	8%	56%
1978	54%	12%	66%
1979	54%	11%	65%

Source: First Congress of the Portuguese Mould Industry, proceedings, 1985
West Europe includes: the UK, East Germany, Ireland, Spain France, Holland, Denmark, Finland, Norway, Sweden Switzerland, Belgium, and Italy.

Table 2E2b shows that only the USA and UK markets accounted, on average, for more than 67% of the Portuguese total exports. This excessive dependence of the industry to these markets makes it very vulnerable to any environmental change.

Table 2E2c - The Portuguese mould exports to the American Continent (AC) and to European Continent (EC) as % of the Portuguese total mould exports, 1970 –1979

Years	AC *	EC	Total = AC + EC
1970	72%	20%	92%
1971	74%	18%	92%
1972	76%	16%	92%
1973	70%	21%	91%
1974	66%	25%	91%
1975	55%	34%	89%
1976	52%	31%	83%
1977	53%	32%	85%
1978	60%	25%	85%
1979	59%	18%	77%

Source: First Congress of the Portuguese Mould Industry, proceedings, 1985
* Includes the USA, Canada, Mexico and Venezuela

Appendix 2E3 - The 80s

For the 80th decade, with the exception from 1985 to 1986 in which the exports declined, the exports of the mould industry increased significantly, both in value and in tones, (see Table2E3a). The imports also increased during the decade, however much lower than the exports.

Table 2E3a - The Portuguese mould industry Exports, Imports, and Trade Balance, 1980-1989

	84.60. Exports				84.60. Imports				Trade Balance	
Years	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc
1980	1.496	1.337.970		895	724	326.203		451	772	1.011.767
1981	1.393	1.758.881	31,5%	1.263	704	502.769	54,1%	714	689	1.256.112
1982	1.650	2.502.070	42,3%	1.516	884	849.558	69,0%	961	766	1.652.512
1983	1.659	3.237.658	29,4%	1.951	437	782.763	-7,9%	1.790	1.222	2.454.895
1984	2.228	5.892.853	82,0%	2.645	413	956.058	22,1%	2.318	1.815	4.936.795
1985	2.547	8.197.400	39,1%	3.219	324	999.673	4,6%	3.084	2.222	7.197.727
1986	2.580	7.847.389	-4,3%	3.042	668	1.316.558	31,7%	1.971	1.912	6.530.831
1987	3.346	10.661.811	35,9%	3.186	902	1.756.203	33,4%	1.947	2.444	8.905.608
1988	3.338	12.149.611	14,0%	3.640	835	1.811.029	3,1%	2.169	2.503	10.338.582
1989	3.680	13.877.091	14,2%	3.771	1.091	2.353.436	30,0%	2.157	2.589	11.523.655
Total	23.917	67.462.734		2.821	6.981	11.654.250		1.669	16.935	55.808.484

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics
84.60. - is the custom nomenclature code for the mould industry

During the 80s, the exports value for the American market increased significantly, registering its highest value in 1987, 5.439.290 billions Esc (see Tables 2E3b to 2E3f).

Table 2E3b - The Portuguese mould exports by countries, 1980-1981

1980					1981				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
USA	656	621.544	46.54	46.54	USA	556	710.572	40.40	40.40
UK	166	158.167	11.84	58.38	UK	142	165.230	9.39	49.79
Sweden	108	101.047	7.57	65.94	Sweden	89	129.654	7.37	57.16
Mexico	56	51.134	3.83	69.77	West Germany	90	121.346	6.90	64.06
West Germany	54	48.887	3.66	73.43	Soviet Union	11	69.686	3.96	68.03
France	33	41.354	3.10	76.53	Brazil	38	61.844	3.52	71.54
Holland	31	36.755	2.75	79.28	France	48	52.577	3.52	75.06
Venezuela	27	25.071	1.88	81.16	Venezuela	31	39.804	2.26	77.32
Spain	59	21.737	1.63	82.78	Holland	33	39.543	2.25	79.57
Israel	18	18.166	1.36	84.14	Israel	24	39.275	2.23	81.80
Norway	18	16.296	2.62	86.77	Switzerland	26	38.638	2.20	84.00
Peru	18	15.641	1.17	87.94	Iraq	26	31.344	1.78	85.78
Brazil	19	12.563	0.94	88.88	Spain	54	29.938	1.70	87.48
Others	229	167.271	11.12	100.00	Others	227	229.430	12.52	100.00
Total	1.492	1.335.633	100.00		Total	1.393	1.758.881	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E3c - The Portuguese mould exports by countries, 1982-1983

1982					1983				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
USA	804	1.276.446	51.02	51.02	USA	856	1.857.757	57.38	57.38
UK	215	276.258	11.04	62.06	UK	89	253.829	7.84	65.22
Sweden	76	126.786	5.07	67.12	West Germany	39	164.364	5.08	70.30
Mexico	29	87.597	3.50	70.63	Israel	62	126.291	3.90	74.20
West Germany	47	82.410	3.29	73.92	France	78	100.010	3.09	77.29
Venezuela	56	78.230	3.13	77.05	Sweden	44	82.121	2.54	79.82
France	61	75.823	3.03	80.08	Venezuela	29	68.262	2.11	81.93
Soviet Union	28	71.826	2.87	82.95	Russia	30	64.632	2.00	83.93
Peru	19	34.627	1.38	84.33	Colombia	22	47.623	1.47	85.40
Israel	20	31.751	1.27	85.60	Holland	23	47.501	1.47	86.86
Iraq	25	32.396	1.29	86.89	Saudi Arabia	41	40.068	1.24	88.10
Morocco	19	29.353	1.17	88.07	Egypt	14	35.753	1.10	89.21
Brazil	14	24.951	1.00	89.06	Argentine	37	32.342	1.00	90.21
Others	236	27.616	10.94	100.00	Others	298	317.105	9.79	100.00
Total	1.650	2.502.070	100.00		Total	1659	3.237.658	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E3d - The Portuguese mould exports by countries, 1984-1985

1984					1985				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
USA	1.364	4.102.564	69.62	69.62	USA	1.562	5.350.527	65.27	65.27
UK	196	481.340	8.17	77.79	UK	202	641.599	7.83	73.10
France	82	147.513	2.50	80.29	Russian	56	273.864	3.34	76.44
Sweden	50	138.233	2.35	82.64	Israel	64	225.100	2.75	79.18
West Germany	52	109.278	1.85	84.49	Venezuela	54	182.732	2.23	81.41
Israel	57	103.024	1.75	86.24	France	47	147.294	1.80	83.21
Venezuela	33	91.213	1.55	87.79	Holland	60	135.204	1.65	84.86
Spain	34	71.354	1.21	89.00	Sweden	55	134.752	1.64	86.50
Saudi Arabia	42	57.363	0.97	89.97	Spain	34	104.912	1.28	87.78
Russian	22	57.028	0.97	90.94	West Germany	45	102.536	1.25	89.03
Egypt	14	40.921	0.69	91.63	Bulgaria	32	94.855	1.16	90.19
Colombia	10	36.101	0.61	92.25	Canada	20	61.545	0.75	90.94
Libyan	20	34.048	0.58	92.82	Brazil	15	52.128	0.64	91.58
Others	253	422.873	7.18	100.00	Others	301	690.352	8.42	100.00
Total	2.228	5.892.853	100.00		Total	2547	8.197.400	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E3e - The Portuguese mould exports by countries, 1986-1987

1986					1987				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
USA	1.401	4.267.719	54.38	54.38	USA	1.746	5.439.290	51.26	51.26
UK	324	915.597	11.67	66.05	UK	310	1.058.617	9.98	61.23
France	81	300.243	3.83	69.88	France	281	725.242	6.83	68.07
West Germany	86	283.170	3.61	73.49	West Germany	194	647.737	6.10	74.17
Holland	68	246.223	3.14	76.62	Sweden	112	424.541	4.00	78.17
Israel	76	229.776	2.93	79.55	Holland	111	393.814	3.71	81.88
Sweden	51	175.940	2.24	81.79	Spain	110	191.658	1.81	83.69
Canada	73	171.317	2.18	83.98	Israel	48	184.838	1.74	85.43
Soviet Union	40	138.897	1.77	85.75	Bulgaria	34	169.357	1.60	87.03
Brazil	25	113.124	1.44	87.19	Soviet Union	39	117.896	1.11	88.14
Spain	58	107.609	1.37	88.56	Venezuela	26	115.650	1.09	89.23
Turkey	18	90.484	1.15	89.71	Canada	40	106.567	1.00	90.23
Egypt	25	89.377	1.14	90.85	Turkey	26	1.025.563	9.66	99.90
Others	254	717.913	9.15	100.00	Others	269	11.041	0.10	100.00
Total	2.580	7.847.389	100.00		Total	3.346	10.611.811	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E3f - The Portuguese mould exports by countries, 1988-1989

1988					1989				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
USA	1.385	4.401.961	36.23	36.23	USA	1251	4.577.205	32.98	32.98
UK	334	1.314.769	10.82	47.05	UK	422	1.743.694	12.57	45.55
France	285	1.156.895	9.52	56.57	France	267	1.371.715	9.88	55.43
West Germany	267	928.240	7.64	64.21	West Germany	406	1.347.120	9.71	65.14
Holland	199	737.223	6.07	70.28	Holland	202	743.807	5.36	70.50
Sweden	112	554.360	4.56	74.85	Sweden	129	687.276	4.95	75.45
Israel	119	465.945	3.84	78.68	Spain	331	685.372	4.94	80.39
Brazil	94	442.802	3.64	82.33	Israel	94	353.873	2.55	82.94
Spain	102	371.564	3.06	85.38	Turkey	75	344.282	2.48	85.42
Turkey	36	161.900	1.33	86.72	Canada	75	267.651	1.93	87.35
Venezuela	31	146.600	1.21	87.92	Venezuela	38	217.975	1.57	88.92
Argentina	20	133.014	1.09	89.02	Belgium/Lux	80	208.451	1.50	90.43
Canada	37	104.795	0.86	89.88	Italy	38	175.458	1.26	91.69
Others	317	1.229.543	10.12	100.00	Others	272	1.153.212	8.31	100.00
Total	3.338	12.149.611	100.00		Total	3680	13.877.091	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E3g - The Portuguese mould industry exports ranked by exports markets, 1980-1989

Ranking	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA
2	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK
3	Sweden	Sweden	Sweden	West Germany	France	Soviet Union	France	France	France	France
4	Mexico	West Germany	Mexico	Israel	Sweden	Israel	West Germany	West Germany	West Germany	West Germany
5	West Germany	Soviet Union	West Germany	France	West Germany	Venezuela	Holland	Sweden	Holland	Holland
6	France	Brazil	Venezuela	Sweden	Israel	France	Israel	Holland	Sweden	Sweden
7	Holland	France	France	Venezuela	Venezuela	Holland	Sweden	Spain	Israel	Spain
8	Venezuela	Venezuela	Soviet Union	Soviet Union	Spain	Sweden	Canada	Israel	Brazil	Israel
9	Spain	Holland	Peru	Colombia	Saudi Arabia	Spain	Soviet Union	Bulgaria	Spain	Turkey
10	Israel	Israel	Israel	Holland	Soviet Union	West Germany	Brazil	Soviet Union	Turkey	Canada
11	Norway	Switzerland	Iraq	Saudi Arabia	Egypt	Bulgaria	Spain	Venezuela	Venezuela	Venezuela
12	Peru	Iraq	Morocco	Egypt	Colombia	Canada	Turkey	Canada	Argentina	Belgium/Lux
13	Brazil	Spain	Brazil	Argentine	Libyan	Brazil	Egypt	Turkey	Canada	Italy

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Appendix 2E4 - The 90s

Table 2E4a - the Portuguese mould industry, exports, imports, trade balance, 1990-2000

	84.80. HS Exports				84.80. HS Imports				Trade Balance	
Years	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc
1990	4.785	18.800.594		3.929	1.074	2.629.418		2.448	3.711	16.171.176
1991	5.018	20.465.274	8,9%	4.078	1.417	3.263.317	24,1%	2.303	3.601	17.201.957
1992	5.954	22.111.750	8,0%	3.714	1.705	3.940.157	20,7%	2.311	4.249	18.171.593
1993	5.081	22.103.880	0,0%	4.350	893	3.152.449	-20,0%	3.530	4.188	18.951.431
1994	5.968	26.443.352	19,6%	4.431	1.351	3.894.915	23,6%	2.883	4.617	22.548.437
1995	6.502	30.295.877	14,6%	4.659	1.362	5.252.416	34,9%	3.856	5.140	25.043.461
1996	7.438	38.301.883	26,4%	5.149	1.224	4.810.579	-8,4%	3.930	6.214	33.491.304
1997	8.534	44.041.780	15,0%	5.161	1.499	6.188.202	28,6%	4.128	7.035	37.853.578
1998	9.440	46.580.690	5,8%	4.934	1.915	6.632.247	7,2%	3.463	7.525	39.948.443
1999	9.872	50.021.054	7,4%	5.067	2.270	7.515.081	13,3%	3.311	7.602	42.505.973
2000	10.475	55.552.560	11,1%	5.303	2.937	8.593.660	14,4%	2.926	7.538	46.958.900
2001*	12.007	65.745.666	18,3%	5.476	3.028	10.471.175	21,8%	3.458	8.979	55.274.491
Total	86.289	421.663.766		52.323	19.601	63.714.198		36.100	66.688	357.949.568

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics
84.80. HS, is the custom nomenclature code of the harmonized system for the mould industry
* an estimated value

Table 2E4b - The Portuguese mould exports by countries, 1990-1991

1990					1991				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
USA	1.243	4.224.112	22.47	22.47	USA	1.125	4.032.275	19.70	19.70
France	532	2.531.235	13.46	35.93	Germany	718	3.237.314	15.82	35.52
Germany	552	2.206.056	11.73	47.67	France	412	2.528.356	12.35	47.88
UK	455	1.912.948	10.17	57.84	UK	449	1.761.306	8.61	56.48
Holland	261	1.141.534	6.07	63.91	Spain	591	1.746.248	8.53	65.02
Spain	350	1.125.408	5.99	69.90	Holland	348	1.302.592	6.36	71.38
Sweden	270	1.076.147	5.72	75.62	Sweden	239	1.125.270	5.50	76.88
Israel	158	539.694	2.87	78.49	Belgiu/Lux	132	609.985	2.98	79.86
Belgiu/Lux	115	519.790	2.76	81.26	Israel	131	497.104	2.43	82.29
SovieticUnion	180	498.591	2.65	83.91	Brazil	86	420.836	2.06	84.34
Italy	81	306.575	1.63	85.54	Turkey	80	373.212	1.82	86.17
Brazil	47	295.484	1.57	87.11	Switzerland	75	361.625	1.77	87.93
Turkey	51	290.781	1.55	88.66	Canada	152	339.756	1.66	89.60
Others	490	2.132.239	11.34	100.00	Others	480	2.129.395	10.40	100.00
Total	4.785	18.800.594	100.00		Total	5.018	20.465.274	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E4c -The Portuguese mould exports by countries, 1992-1993

1992					1993				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
USA	1.145	4.247.264	19.21	19.21	USA	1.269	5.340.692	24.16	24.16
Germany	1.294	3.838.180	17.36	36.57	Germany	694	3.237.480	14.65	38.81
France	586	2.861.183	12.94	49.51	UK	473	2.084.404	9.43	48.24
UK	628	1.600.439	7.24	56.74	France	381	1.977.773	8.95	57.19
Spain	423	1.548.976	7.01	63.75	Spain	326	1.090.101	4.93	62.12
Holland	351	1.431.620	6.47	70.22	Holland	220	1.071.925	4.85	66.97
Sweden	252	1.255.728	5.68	75.90	Sweden	213	1.064.190	4.81	71.78
Belgiu/Lux	164	914.224	4.13	80.04	Turkey	157	846.699	3.83	75.61
Israel	178	780.066	3.53	83.56	Israel	199	810.753	3.67	79.28
Turkey	123	477.621	2.16	85.73	Belgiu/Lux	212	752.755	3.41	82.69
Brazil	97	403.323	1.82	87.55	Brazil	73	513.530	2.32	85.01
Finland	73	264.626	1.20	88.75	Switzerland	115	404.888	1.83	86.84
Italy	86	239.152	1.08	89.83	Mexico	61	380.328	1.72	88.56
Others	554	2.249.348	10.17	100.00	Others	688	2.528.362	11.44	100.00
Total	5.954	22.111.750	100.00		Total	5.081	22.103.880	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E4d - The Portuguese mould exports by countries, 1994-1995

1994					1995				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
USA	1.473	6.095.077	23.05	23.05	USA	1.668	6.103.269	20.15	20.15
Germany	744	3.422.959	12.94	35.99	France	894	4.788.448	15.81	35.95
France	624	3.042.395	11.51	47.50	Germany	919	4.461.399	14.73	50.68
UK	538	2.009.743	7.60	55.10	UK	399	2.127.830	7.02	57.70
Belgiu/Lux	355	1.935.750	7.32	62.42	Holland	334	2.064.044	6.81	64.51
Holland	205	1.131.411	4.28	66.70	Israel	328	1.476.077	4.87	69.39
Israel	264	1.083.464	4.10	70.80	Belgiu/Lux	224	1.414.409	4.67	74.05
Sweden	206	1.042.962	3.94	74.74	Sweden	213	1.266.471	4.18	78.23
Brazil	213	915.931	3.46	78.20	Brazil	226	1.242.678	4.10	82.34
Spain	182	912.933	3.45	81.66	Spain	260	1.151.310	3.80	86.14
Turkey	147	701.588	2.65	84.31	Switzerland	152	398.964	1.32	87.45
Mexico	83	649.537	2.46	86.77	Morocco	91	329.621	1.09	88.54
Switzerland	111	505.274	1.91	88.68	Turkey	51	292.876	0.97	89.51
Others	823	2.994.328	11.32	100.00	Others	743	3.178.481	10.49	100.00
Total	5.968	26.443.352	100.00		Total	6.502	30.295.877	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E4e - The Portuguese mould exports by countries, 1996-1997

1996					1997				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
France	1.054	6.223.731	16.25	16.25	USA	1.442	6.759.063	15.35	15.35
USA	1.408	6.162.168	16.09	32.34	Germany	1.205	6.307.543	14.32	29.67
Germany	954	4.994.329	13.04	45.38	France	1.100	6.097.834	13.85	43.51
Sweden	530	3.634.810	9.49	54.87	UK	556	4.276.937	9.71	53.23
Holland	500	2.885.483	7.53	62.40	Sweden	690	3.844.956	8.73	61.96
UK	365	2.041.187	5.33	67.73	Holland	438	2.359.778	5.36	67.31
Brazil	327	1.760.873	4.60	72.33	Brazil	583	2.267.484	5.15	72.46
Belgiu/Lux	293	1.602.851	4.18	76.51	Spain	428	1.752.129	3.98	76.44
Israel	269	1.593.011	4.16	80.67	Israel	323	1.708.616	3.88	80.32
Spain	322	1.352.513	3.53	84.20	Belgiu/Lux	330	1.515.803	3.44	83.76
Turkey	143	757.776	1.98	86.18	Argentina	151	694.741	1.58	85.34
Canada	137	595.314	1.55	87.73	Canada	159	634.795	1.44	86.78
Switzerland	195	510.723	1.33	89.07	Turkey	114	624.797	1.42	88.20
Others	941	4.187.114	10.93	100.00	Others	1.015	5.197.304	11.80	100.00
Total	7.438	38.301.883	100.00		Total	8.534	44.041.780	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E4f - The Portuguese mould exports by countries, 1998-1999

1998					1999				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
Germany	1.648	7.062.962	15.16	15.16	France	1.751	9.175.450	18.34	18.34
USA	1.221	6.438.489	13.82	28.99	USA	1.577	7.593.495	15.18	33.52
France	879	5.303.881	11.39	40.37	Germany	1.344	7.280.349	14.55	48.08
UK	747	5.027.947	10.79	51.17	Spain	978	4.645.526	9.29	57.37
Brazil	926	3.917.082	8.41	59.57	UK	539	3.419.811	6.84	64.20
Sweden	395	2.540.020	5.45	65.03	Israel	536	2.395.575	4.79	68.99
Spain	581	2.240.508	4.81	69.84	Sweden	335	1.956.782	3.91	72.90
Holland	481	1.869.070	4.01	73.85	Belgiu/Lux	446	1.839.244	3.68	76.58
Israel	330	1.652.323	3.55	77.40	Brazil	408	1.834.953	3.67	80.25
Belgiu/Lux	305	1.461.359	3.14	80.53	Holland	244	1.824.977	3.65	83.90
Turkey	218	1.150.019	2.47	83.00	Switzerland	306	904.901	1.81	85.71
Mexico	99	841.409	1.81	84.81	Mexico	158	775.174	1.55	87.26
Switzerland	276	698.113	1.50	86.31	Italy	161	656.892	1.31	88.57
Others	1.334	6.377.508	13.69	100.00	Others	1.089	5.717.925	11.43	100.00
Total	9.440	46.580.690	100.00		Total	9.872	50.021.054	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics

Table 2E4g - The Portuguese mould exports by countries, 2000-2001*

2000					2001*				
Countries	tones	1000 Esc	% Total	% Accum.	Countries	tones	1000 Esc	% Total	% Accum.
France	10.475	55.552.560	18.70	18.70	France	2.515	14.190.116	21.58	21.58
USA	1.848	10.390.782	16.91	35.61	Germany	1.857	10.671.256	75.20	75.20
Germany	1.589	9.393.985	13.67	49.28	USA	1.359	7.355.083	68.92	68.92
Spain	1.531	7.592.052	10.41	59.69	Spain	1.447	6.888.562	93.66	93.66
UK	1.211	5.782.502	9.99	69.68	UK	576	5.217.143	75.74	75.74
Israel	727	5.547.337	4.71	74.39	Holland	482	2.621.101	50.24	50.24
Sweden	577	2.617.293	4.28	78.67	Sweden	640	2.263.642	86.36	86.36
Belgiu/Lux	423	2.378.118	3.59	82.26	Mexico	282	2.076.994	91.75	91,.75
Brazil	356	1.995.598	2.61	84.87	Belgiu/Lux	305	1.711.314	82.39	82.39
Holland	241	1.449.485	2.00	86.87	Brazil	425	1.613.078	94.26	94.26
Switzerland	332	1.112.074	1.60	88.47	Israel	216	1.236.774	76.67	76.67
Mexico	128	886.331	1.36	89.83	Italy	241	1.126.308	91.07	91.07
Italy	263	757.020	1.03	90.86	Switzerland	264	894.751	79.44	79.44
Others	978	5.078.008	9.14	100.00	Others	1.398	7.879.544	11.98	100.00
Total	10.475	55.552.560	100.00		Total	12.007	65.745.666	100.00	

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics
*an estimated value

Table 2E4h - Portuguese mould industry exports, ranked by main exports markets, 1990-2001

Ranking	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001*
1	USA	USA	USA	USA	USA	USA	France	USA	Germany	France	France	France
2	France	Germany	Germany	Germany	Germany	France	USA	Germany	USA	USA	USA	Germany
3	Germany	France	France	UK	France	Germany	Germany	France	France	Germany	Germany	USA
4	UK	UK	UK	France	UK	UK	Sweden	UK	UK	Spain	Spain	Spain
5	Holland	Spain	Spain	Spain	Belgiu/Lux	Holland	Holland	Sweden	Brazil	UK	UK	UK
6	Spain	Holland	Holland	Holland	Holland	Israel	UK	Holland	Sweden	Israel	Sweden	Holland
7	Sweden	Sweden	Sweden	Sweden	Israel	Belgiu/Lux	Brazil	Brazil	Spain	Sweden	Holland	Sweden
8	Israel	Belgiu/Lux	Belgiu/Lux	Turkey	Sweden	Sweden	Belgiu/Lux	Spain	Holland	Belgiu/Lux	Israel	Mexico
9	Belgiu/Lux	Israel	Israel	Israel	Brazil	Brazil	Israel	Israel	Israel	Brazil	Belgiu/Lux	Belgiu/Lux
10	Soviet Union	Brazil	Turkey	Belgiu/Lux	Spain	Spain	Spain	Belgiu/Lux	Belgiu/Lux	Holland	Brazil	Brazil
11	Italy	Turkey	Brazil	Brazil	Turkey	Switzerland	Turkey	Argentina	Turkey	Switzerland	Mexico	Israel
12	Brazil	Switzerland	Finland	Switzerland	Mexico	Morocco	Canada	Canada	Mexico	Mexico	Switzerland	Italy
13	Turkey	Canada	Italy	Mexico	Switzerland	Turkey	Switzerland	Turkey	Switzerland	Italy	Italy	Switzerland

Source: ICEP - Investments, Trade and Tourism of Portugal, and INE - The National Institute of Statistics
* an estimated value

Table 1E5a - Industries served, as % of total production, 1984, 1991,1994, 1997* to1999

Years	Automobile	Electronic/ Telecommunications	Electric	Domestic Appliances	Domestic Utilities	Toys	Office	Packaging	Others
1984	1%	21%		9%	14%	28%	1%	13%	13%
1991	14%	9%	13%	34%		8%	3%	7%	12%
1994	20%	9%	10%	32%		8%		9%	12%
1997*	20%	9%	11%	32%		8%		10%	10%
1998	32%	6%	23%	14%		3%		13%	9%
1999	27%	12%	6%	7%	7%	2%		18%	21%
2000	27%	12%	6%	7%	7%	2%		18%	21%

Source: CEFAMOL
* an estimated value
Note: the years used correspond to the only data available

Appendix 2F - The Exchange rates

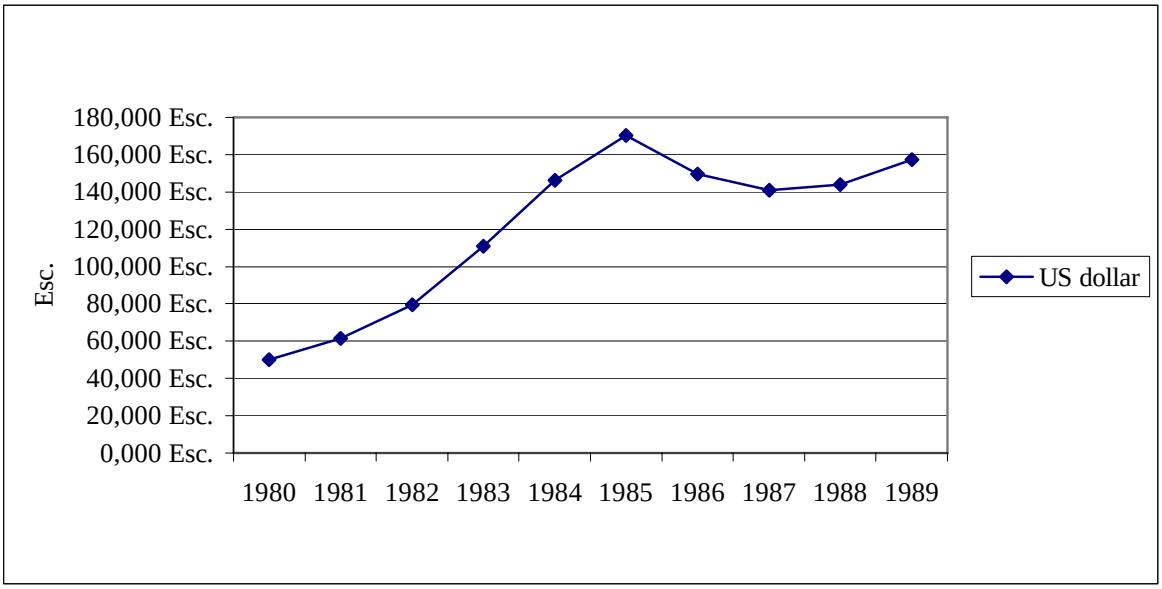
Another important factor, which may influence the Portuguese mould makers business and its profitability are the exchange rates. Exchanges rates may vary, and that variation may affect favourably or negatively the mould business. As seen previously, the Portuguese managers were mainly exporting to the US market. Therefore it is important to analyse the evolution of the US dollar-Portuguese Escudo exchange rate.

From 1980 to the 1985 the USA dollar-Escudo increased significantly (see Figure 2Fa). In 1980, 1 US dollar = 50$062 Esc, in 1984 1US dollar = 146$390 and in 1985, 1 US dollar = 170$395 Esc. However, after 1985 to 1987 the dollar started to decrease, increasing again in 1989.

Most of the firms were selling to the USA market, and therefore doing their contracts in dollars. The mould manufacturing process can be long, and it is difficult to forecast the value of the exchange rate for the time that the mould is finished. During the manufacturing process, which could be of one year or more, the exchange rate may vary, and the mould makers may make a profit or a loss just due to the variation of the exchange rate. For example if the Portuguese mould maker establishes the price of the mould at 15.000.000$00 Escudos, with the dollar exchange rate at $1 Dollar = 146$00 Escudos, he/she will be doing business for $102.740 Dollars. If the Dollar-Escudo exchange rate changes and the new value becomes, $1 Dollar = 170$00 Escudos, the mould maker still receives $102.740 Dollars, but now that is worth 17.465.800$00 Escudos. Therefore, the mould maker gained 2.465.800$00 Escudos just as a result of the exchange rate variation. Was this exchange rate gain that, besides the high interest rates, allowed the PMMF to invest in technology in the 1980s. The gains of Dollar-Escudo exchange rate were superior to the interest rate paid.

Figure 2Fa - The US dollar-Escudo exchange rate, 1980-1989

Years	US dollar
1980	50,062 Esc.
1981	61,546 Esc.
1982	79,473 Esc.
1983	110,780 Esc.
1984	146,390 Esc.
1985	170,395 Esc.
1986	149,587 Esc.
1987	140,882 Esc.
1988	143,954 Esc.
1989	157,458 Esc.



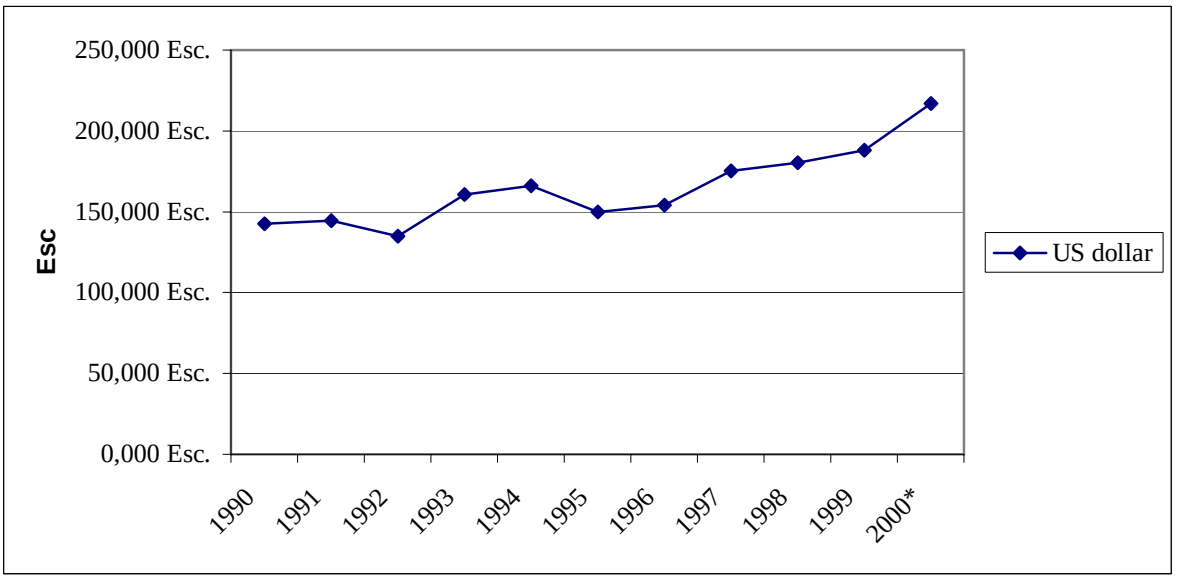
Source: Bank of Portugal

During the 1990s the US dollar-Escudo exchange rate varied significantly (see Figure 2Fb). After the increasing in 1989, the US dollar dropped to 142$555 Esc in 1990, and achieved its lowest value in 1992, i.e. 1 US dollar = 134$998 Esc. The process described above worked reversibly; the Portuguese mould makers lost money. The Portuguese mould makers have seen the American customers as less interesting, and some started to look for customers elsewhere, namely within the European Community market.

After 1992 the US dollar increased, stabilising in 1995, and after that non-stop to increase reaching its highest value ever, in 2000, i.e. 1 US dollar = 217$022 Esc. The high value of the US dollar-Esc exchange rate favours again, as it happened in the period 1980-1985, the Portuguese mould makers. However customer's relationships have been already established within the European Community market.

Figure 2Fb - The US dollar-Escudo exchange rate 1990-2000

Years	US dollar
1990	142,555 Esc.
1991	144,482 Esc.
1992	134,998 Esc.
1993	160,779 Esc.
1994	165,993 Esc.
1995	150,008 Esc.
1996	154,174 Esc.
1997	175,342 Esc.
1998	180,237 Esc.
1999	188,169 Esc.
2000*	217,022 Esc.



Source: Bank of Portugal
* Until November

Appendix 2G - Statistical information of the International Special Tooling and Machining Association-ISTMA

Appendix 2G1 - Definitions of ISTMA business figures and ratios:

- Investments in new technology = Capital spent in new technologies, including self-made machinery. Leasing expenditures have to be included.

- Liquidity = Short term assets divided by short-term liabilities. When the ratio is superior to 1, especially when it is close to 2, means that is a good ratio (see Caldeira Menezes, 1988).

- Net operating profit = Turnover – (goods and services purchased + employees costs + depreciation + financial changes) + financial profits.

- Subcontracting = Parts and technical services, e.g. heat and surface, treatment, machining, etc.

- Total employees = all the employees of the firm, including managers, owners or apprentices.

- Added value = Turnover minus all the goods and services purchased by the firm from others, i.e. costs of raw materials, expenses for gas, electricity, telephone, fax, postage, standard parts, semi finished goods, freights, computer services, advertising, insurance, etc.

- Employees' total costs = Total wages and total salaries spent for all employees, including social service payments and benefits (required by law or voluntary) as well as entrepreneur's remuneration.

Appendix 2G2 - Information of ISTMA association

ISTMA statistics are based upon on the information provided by the mould sector association of each associated country. It may happen that one country has more than one mould association. However, only one is associated to ISTMA and supplies the information. With the exception of Portugal and in some cases France, that present findings only related to moulds, the findings of all the other ISTMA associated countries include:

- Tools for pressing, stamping or punching for metal working, which the CN (Custom Nomenclature) code is 8207 30 10
- Moulds for plastics and rubber; injection or compression types, with the CN code 8480 71 00 and 8480 79 00
- Moulds for metal or metal carbides; injection or compression types, with the CN code 8480 41 00
- Jigs and fixtures for specific applications; sets of standard jig and fixture components, with the CN code 8466 20 10, and
- Standard tooling components.

Other aspect to emphasise is that ISTMA associated countries such as Austria, Belgium, Ireland, Switzerland and Sweden, have a limited number of participating firms for the statistics (see Table 2G2). To ensure data validity of the findings it would be necessary to acknowledge the representativeness of the samples. However, this information is not known. It could be that the ISTMA statistics are not representative as desirable of the mould industry population of each country. Therefore, data comparability between countries might be biases due to data representativeness, and conclusions must be taken with cautious. Nonetheless, besides the possible methodological gap, ISTMA is the only known official institution providing worldwide mould statistical information, and therefore the current study has decided to use its data.

The currency used to analyse the data was the European Currency Unit - the ECU, which after 1997 was designated as Euro. For employees' wage comparisons was used exchange rate of 31 of May of the following year to which the analysis respects.

Table 2G2 - Number of participating firms, in 1990-1998

ISTMA associated countries	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentine								16	16
Austria				4	4	4			
Belgium	8	7	8	5	5	8	8	8	6
Canada							83	82	91
Denmark (4)									
Finland	5	7	7	7	7	15	15	15	15
France (1)	32	29	40	38	47	41	45	50	48
Germany (2)	24	18	19	25	26	26	27	35	34
Great Britain	3	6	14	7	4	6	13	13	8
Ireland		5	4	3	4	4			
Italy	25	29	20	26	24	23	26	25	24
Japan	67	62	60	36	18	35	53	59	84
Korea	40	40	16	18	8	25	1901	23	22
Netherlands			5	24	15	29	32	22	32
Portugal (3)	20	25	27	30	56	50	47	45	40
Spain	28	24	20	18	17	21	25	18	17
Sweden (4)					3	4	4	2	
Switzerland	10	6	5	6	6	9	8	7	5
Taiwan								27	106
USA	1218	1000	990	809	615	900	900	1043	820

Source: ISTMA
Note: the number of participating firms for 1989, 1989 and for 1999 and 2000 is not available
(1) the value for France includes mould and stamping die-special tooling firms, i.e. :
- for 1990 it includes 12 mould firms, and 20 dies firms, total =32 firms,
- for 1991 it includes 15 mould firms, and 14 dies firms, total =29 firms
- for 1992 it includes 25 mould firms, and 15 dies firms, total =40 firms
- for 1993 it includes 23 mould firms, and 15 dies firms, total =38 firms
- for 1994 it includes 34 mould firms, and 13 dies firms, total =47 firms
(2) for 1990, West Germany
(3) only moulds
(4) it is not available the number of participating firms for Denmark for all the period and for Sweden for 1998

Appendix 2G3 - ISTMA comparative statistics: turnover, exports and imports

Turnover

For 1988-1998 there was a generally gradual growth of the mould industry in terms of turnover (see Table 2G3a). In 1988 the USA accounted for the highest turnover and was followed by Japan and Germany respectively. Among the three countries with the lowest sales Netherlands, occupied the first place, and was followed by Finland and Portugal. After one decade, in 1998, the USA continued to lead the sales of the ISTMA association. Japan and Germany kept the second and third position respectively. Portugal ranked tenth as the country with the highest turnover. It is interesting to note the remarkable growth of Taiwan, occupying the fourth position, just after Germany, and before countries such as Italy and France, with a great tradition in the manufacture of moulds (Italy and France occupy the sixth and seventh position respectively). A possible explanation is the increased globalisation of the markets, new technological developments that allow easy access to information to everyone, everywhere, and their competitive prices. In 1998 the three countries with the lowest sales, were Argentine, Finland and Belgium, (first, second and third place respectively). Compared to 1988, Finland maintained the second lowest turnover.

Another interesting aspect to emphasise in Table 2G3a was the turnover breakpoints during the decade. There was a generalised growth from 1988 to 1998; however, from 1989 to 1990, from 1991 to 1992 and from 1997 to 1998 there were important turnover declines (see total value in Table 2G3a). These infection points to growth in the beginning of the 90s could be explained by an international economic crisis.

Portugal, during the decade (1988-1998) accompanied the general growth. Is interesting to note that the infections to the turnover growth happen in different time from the general trend, i.e. from 1990 to 1991 (one year after the first general decline), and from 1993 to 1994, suggesting that the impact of an international economic crisis is felt in Portugal one year later. After 1995 to 1998 the Portuguese turnover increased significantly and more than the general growth.

Table 2G3a – Turnover, 1988-1998, (Euros 10^3),

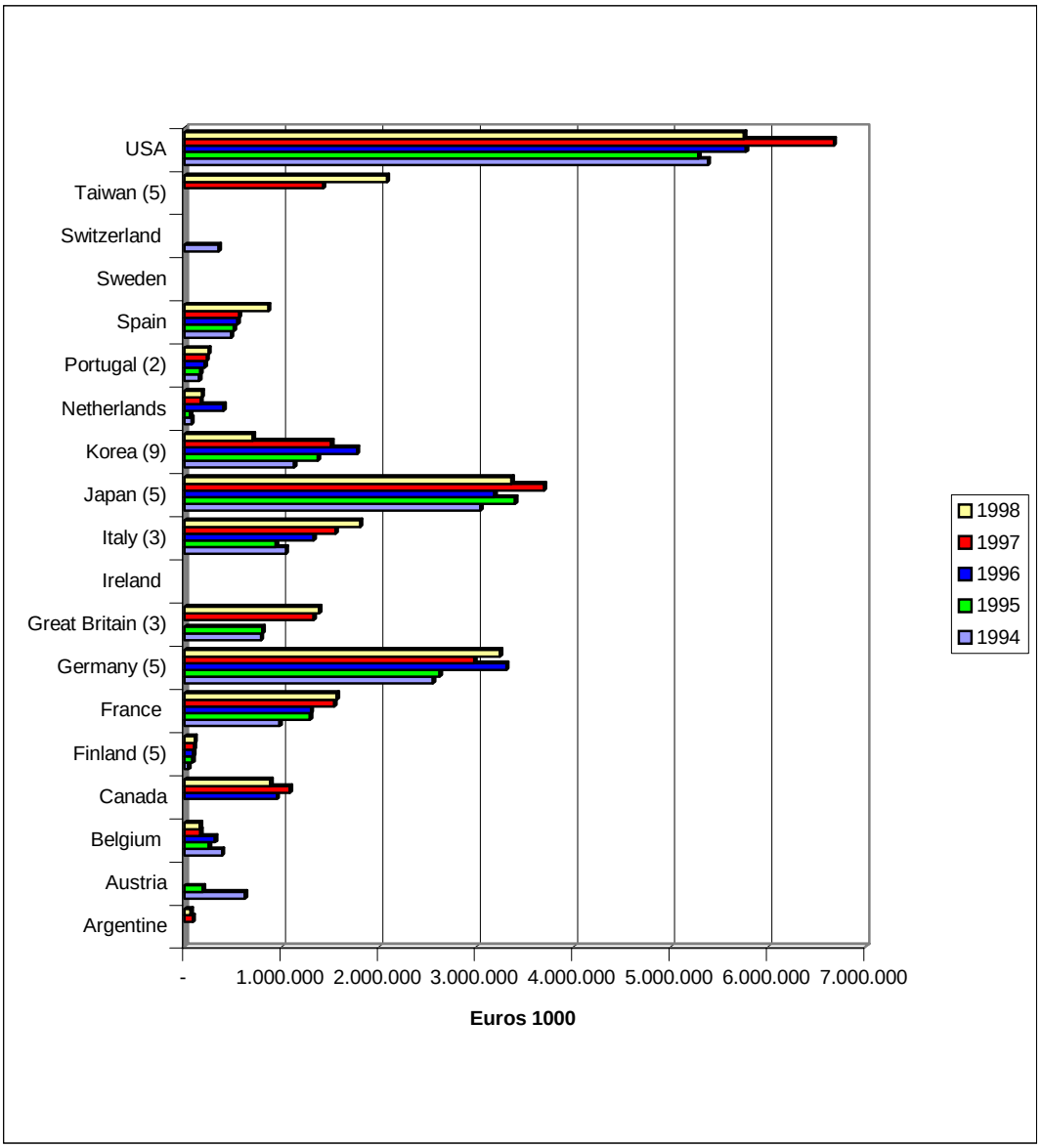
Countries	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentine										85.864	63.371
Austria						86.613	623.011	189.647			
Belgium	106.616	323.022	377.694	343.354	419.840	235.652	386.310	253.074	316.332	165.343	157.236
Canada									949.358	1.086.149	882.470
Finland (5)	77.938	66.284	58.660	42.409	33.993	32.984	39.561	82.530	91.504	99.671	104.663
France (8)	602.778	540.423	773.321	861.800	936.625	955.730	979.268	1.290.232	1.300.766	1.539.330	1.567.726
Germany (5)(6)	1.550.623	1.701.092	2.075.420	2.517.420	2.483.163	2.589.578	2.557.401	2.623.645	3.308.396	2.978.799	3.242.861
Great Britain (3)(4)	445.324	548.737	503.747	526.746	532.527	699.240	788.244	801.490		1.326.397	1.384.358
Ireland				804.839							
Italy (3)		926.864	985.558	1.043.442	1.002.814	1.031.919	1.044.354	938.905	1.327.235	1.554.968	1.807.009
Japan (5)	2.766.153	2.973.911	2.544.669	3.267.783	2.677.207	3.363.458	3.043.850	3.397.945	3.187.495	3.696.864	3.364.761
Korea (9)	832.257	1.053.302	998.483	1.069.364	920.905	1.047.895	1.129.908	1.372.355	1.775.854	1.508.780	701.478
Netherlands (3)(4)	62.832	132.093	81.873	105.020	113.789	22.205	75.014	60.079	400.751	168.716	180.587
Portugal (2)	97.351	120.300	134.034	131.293	151.680	157.138	154.447	164.555	207.294	229.821	248.574
Spain	528.215	566.903	590.097	605.049	560.409	480.010	481.311	506.785	544.473	562.039	862.145
Sweden (5)(7)	118.628	219.265	151.372								
Switzerland	318.285	325.966	357.955	326.666	323.077	338.691	353.424				
Taiwan (5)										1.425.940	2.082.046
USA	5.372.597	5.484.597	4.745.844	4.007.508	4.018.444	4.844.535	5.379.871	5.283.920	5.769.722	6.675.384	5.752.787
Total	12.879.597	14.982.759	14.378.727	15.652.693	14.174.473	15.885.648	17.035.974	16.965.162	19.179.180	23.104.065	22.402.072

Source: ISTMA
(2) Data supplied by CEFAMOL
(3) Estimated value for Italy, for 1989, 1991, 1992, 1993, 1994, 1997 and 1998, for Netherlands for 1989, and for Great Britain for1995 and 1997
(4) Firms with less than 20 employees were not included, for 1989 for Great Britain and for 1993 for Netherlands
(5) It includes the production in plants of integrated tools in the automobile and plastic industries for Japan and Sweden for 1989, for Germany and Japan for 1991,1992, 1993, and 1994, for Germany for 1995, and for Finland, Japan and Taiwan for 1998
(6) West Germany for 1988, 1989
(7) Incomplete data for Sweden for 1989
(8) For France for 1998, tool and die industry only
(9) For Korea 1996 for, it includes other dies and moulds

In order to simplify the ISTMA statistics analyses and its general trends the current research selected a period of 5 years, i.e. 1994-1998.

Figure 2G3a was developed to show the general trends of turnover of the ISTMA associated countries for 1994 to 1998.

Figure 2G3a - Turnover, 1988-1998, (Euros 10^3)



Source: ISTMA
(2) Data supplied by CEFAMOL
(3) Estimated value for Italy for 1994, for Great Britain for 1994,1995, for Great Britain and Italy for 1997, and for Italy for 1998
(5) It includes the production in plants of integrated tools in the automobile and plastic industries for Germany and Japan for 1994, for Germany for 1995, and for Finland, Japan and Taiwan for 1998
(8) For 1998 for France tool and die industry only
(9) For 1996 for Korea it includes other dies and moulds

The Figure 2G3a shows that in terms of turnover, the USA led the total sales and was followed by Japan and Germany. Other important aspect to emphasise is the remarkable growth of the Taiwan total sales and the significant decline of the Korea turnover. The Taiwanese growth could be justified by their increased quality standards as well as low prices. According to some Portuguese mould managers' countries such as Taiwan used to manufacture moulds of relatively simplicity building their competitive advantages on low costs. However, this situation has changed, and the Taiwanese mould makers are currently producing moulds of high quality standards, high complexity degree and at very competitive prices. The Korean decline could be underlined by an economic recession that the South Korea has gone through in the preceding years (1996, 1997).

Exports

Table 2G3b reveals that for 1988-1998 there was, on average, a continued growth of the exports of the ISTMA associated countries (see Table 2G3b), with only an inflection point from 1997 to 1998. Portugal, contrary to the general trend, from1997 to 1998, had a significant growth in their exports value.

In 1988 the Japan accounted for the highest exported value, and was followed by Germany and USA. In 1988 the lowest export values were presented, by Finland, Denmark and Sweden. Ten years latter, in 1998, Germany leads the exports. Germany was followed by Italy and Canada. If we compare both exports and turnover value in 1998, (the highest values of turnover were shown by: the USA, Japan and Germany and of export were shown by: Germany, Italy and Canada) can be suggested that the majority of moulds produced by the American and Japanese mould makers were to the domestic plastic buyers, and the production of the German and Italian mould makers were to export. Argentine, Finland and Belgium were the three countries with the lowest exports value.

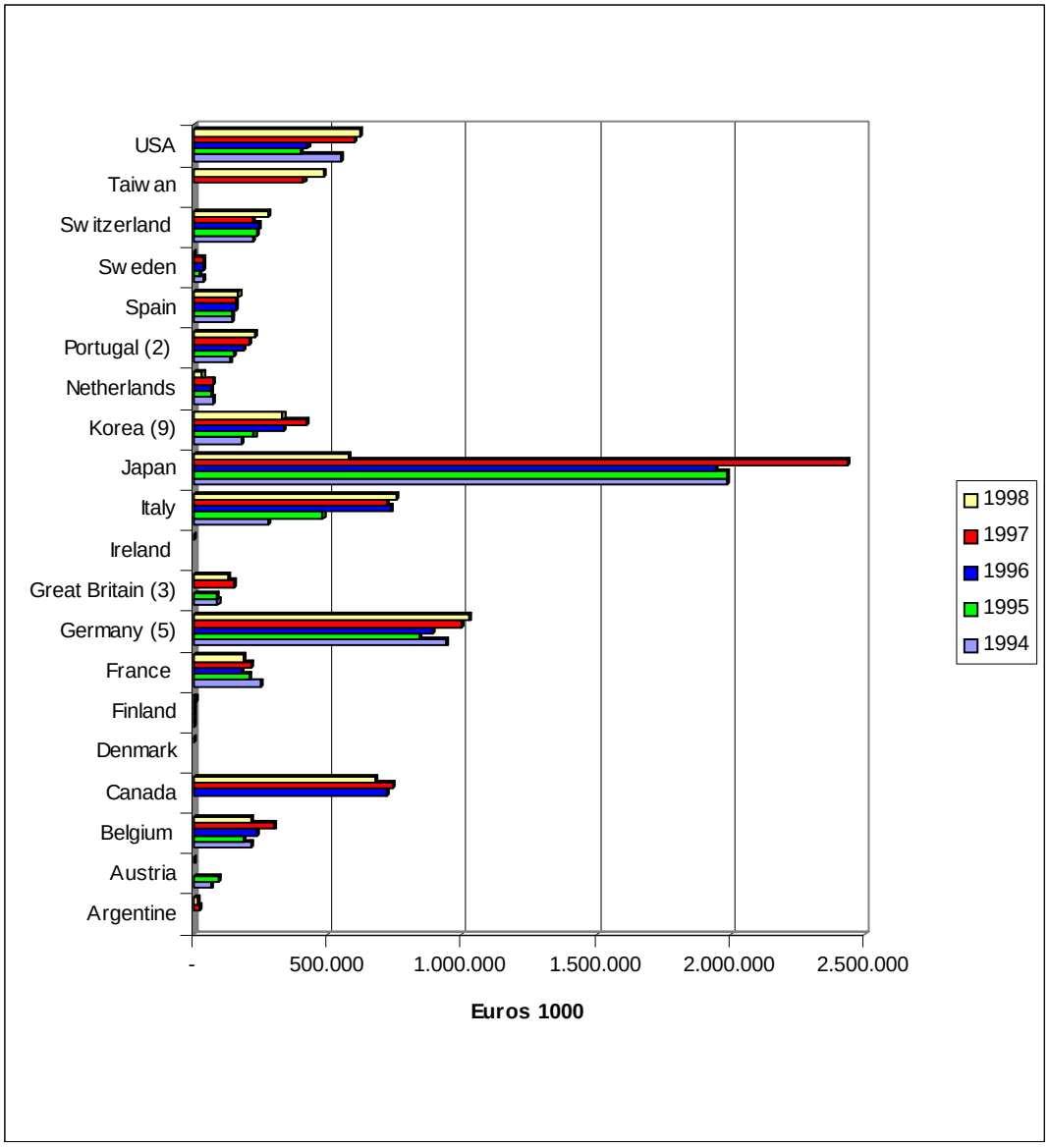
Table 2G3b - Exports, 1988-1998, (Euros 10^3)

Countries	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentine										21.869	16.705
Austria						55.051	66.472	91.030			
Belgium	60.237	191.492	204.781	217.377	235.779	127.957	214.158	184.591	234.384	299.556	212.791
Canada									717.851	739.465	677.268
Denmark	13.121	17.553	21.101	22.167	27.203						
Finland	8.324	5.847	4.804	3.501	3.115	3.004	3.547	3.402	3.535	3.333	5.517
France	127.491	151.931	163.301	214.457	190.969	256.754	252.658	204.256	177.543	216.984	188.716
Germany (6)	525.037	567.026	706.373	739.870	940.619	786.509	940.153	841.586	888.900	1.000.148	1.025.153
Great Britain (4)	70.028	71.829	68.568	64.180	68.000	64.779	90.089	87.356		151.046	131.905
Ireland				224.795							
Italy (1)	159.570	158.403	191.826	227.726	225.020	245.076	280.855	480.998	734.723	719.048	754.313
Japan (5)	918.218	1.087.304	850.661	1.285.744	1.311.540	1.648.934	1.984.193	1.983.969	1.942.485	2.432.204	580.527
Korea (9)	51.238	85.615	97.003	117.789	106.628	145.694	179.604	224.964	332.458	421.101	332.185
Netherlands (1)(8)	91.400	98.804	108.434	114.454	98.590	70.557	73.979	66.466	66.967	72.150	32.718
Portugal (2)	72.789	82.388	95.083	104.586	133.385	133.885	134.301	147.321	188.226	206.839	231.662
Spain	113.065	130.987	125.569	136.857	161.201	132.896	141.186	144.736	154.279	157.035	168.223
Sweden (5)	19.292	21.733	25.845	31.145	35.612	36.385	38.951	22.207	35.219	38.610	
Switzerland (7)	162.037	169.060	193.701	181.105	186.264	205.180	219.826	234.321	241.980	220.012	278.640
Taiwan										410.391	484.139
USA (3)	231.725	520.557	483.083	162.252	202.092	330.286	548.668	398.255	424.589	601.205	619.945
Total	2.623.572	3.360.529	3.340.133	3.848.005	3.926.017	4.242.947	5.168.640	5.115.458	6.143.139	7.710.996	5.740.407

Source: ISTMA
(1) For Italy, for 1988 to 1992 the findings were supplied by the National Statistics Office - N.S.O. (compiled by ISTMA). For Netherlands for 1990, the findings were supplied by the N.S.O.
(2) Data supplied by CEFAMOL
(3) Estimated value for 1988 for USA
(4) For 1989, firms with less than 20 employees were not included
(5) It includes the production in plants of integrated tools in the automobile and plastic industries for 1989 for Japan and Sweden
(6) West Germany for 1988, 1989
(7) For 1988 the findings are not comparable to those of 1987, due to custom nomenclature alterations
(8) For 1988 exports superior to turnover as a result of re-exports.
(9) For 1996 for Korea it includes other dies and moulds

As can be seen in Figure 2G3b, for the period 1994-98, Japan led remarkably the exports value and was followed in decreasing value by Germany and the USA. Nonetheless, from 1997 to 1998 Japan also presented the highest reduction of the exports, falling for the fourth position, after Germany, the USA, and Canada. A possible explanation may be the high value of the Yen versus American dollar, turning the Japanese goods more expensive, and therefore more difficult to export. Contrary to the Japanese exports decline, Taiwan has shown the most significant exports growth. The reason was similar to that already mentioned for the turnover growth.

Figure 2G3b - Exports, 1988-1998, (Euros 10^3)



Source: ISTMA
(2) Data supplied by CEFAMOL
(3) Estimated value for 1994 for Great Britain
(5) It includes the production in plants of integrated tools in the automobile and plastic industries for 1995 for Germany
(9) For 1996 for Korea it includes other dies and moulds

Imports

For the decade 1988-1998 the imports value increased (Table 2G3c) but lower than the turnover or exports. In 1988 the imports were led primary by the USA and were followed by Germany and France. It is important to note that the USA in 1988 had the highest turnover as well as the highest imports value, underling that the American mould production is not sufficient for the internal demand or not adequated to the American plastic buyers' needs, forcing them to import moulds. The countries that were less dependent on the mould imports were Finland, Portugal and Sweden. For 1998, the imports continued to be led, by the USA. Germany, alike in 1988, has maintained the second position as the country with highest imports value. Canada followed Germany in third place. Related to the countries with the lowest dependency on imports, Portugal shows the lowest value. Portugal was followed by Netherlands and Finland. Contrary to the general trend, Portugal significantly declines its imports value. In the beginning of the 90s the Portuguese economy was affected by an international economic crisis, which has slowed down all the Portuguese imports. Portugal imports mainly tools for pressing stamping or punching, jigs and fixtures for specific applications, standard tools components, and steel.

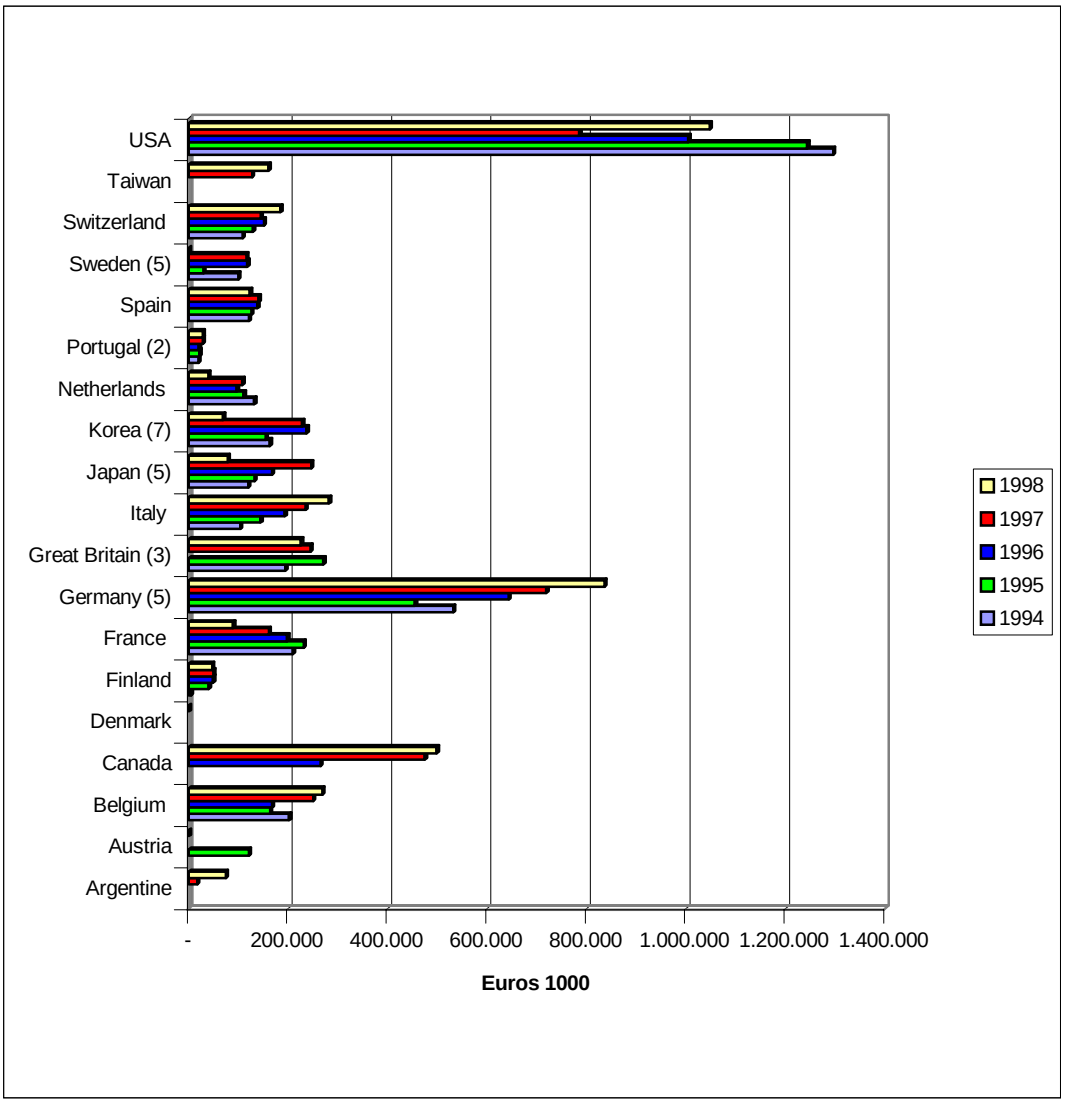
Table 2G3c - Imports, 1988-1998, (Euros 10^3)

Countries	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentine										17.354	74.922
Austria						46.243		121.374			
Belgium	80.571	182.834	232.583	317.708	305.333	176.483	201.820	163.652	167.099	250.122	268.458
Canada									265.016	474.757	498.674
Denmark	23.713	27.379	28.845	32.778	37.346						
Finland	9.361	8.178	8.062	6.253	4.647	4.003	4.715	40.436	48.866	49.838	47.066
France	172.340	210.569	256.258	283.170	349.079	225.513	209.480	231.315	197.892	160.802	89.109
Germany (5)(6)	293.981	323.990	424.642	491.870	553.109	464.083	531.928	454.469	642.906	718.544	836.184
Great Britain (3)(4)	159.585	199.459	177.125	217.434	230.095	135.684	194.097	270.577		245.210	225.714
Italy (1)	46.907	47.790	68.248	67.945	85.709	90.788	103.383	144.330	193.264	235.058	281.809
Japan (5)	60.231	87.100	96.761	131.192	117.653	106.585	119.722	132.494	167.116	246.497	78.602
Korea (7)	91.920	103.269	109.890	118.459	125.497	163.813	162.864	154.643	237.124	228.300	69.321
Netherlands (1)	105.105	100.511	122.923	123.887	144.097	84.113	131.618	110.539	96.386	107.865	39.616
Portugal (2)	11.427	21.803	18.829	14.872	16.152	14.732	19.782	21.411	20.532	28.138	28.640
Spain	130.597	100.161	108.569	128.339	208.806	135.404	120.723	125.859	138.104	140.457	123.164
Sweden (5)	39.221	50.083	109.890	84.654	118.356	113.270	99.690	29.617	118.066	115.870	
Switzerland				97.605	100.000	105.769	108.556	129.194	151.413	144.891	184.147
Taiwan										127.324	160.262
USA (3)	431.863	800.556	621.816	162.252	429.513	672.887	1.295.097	1.243.527	1.004.205	785.013	1.047.278
Total	1.656.822	2.263.682	2.384.441	2.278.418	2.825.392	2.539.370	3.303.475	3.373.437	3.447.989	4.076.040	4.052.966

Source: ISTMA
(1) For 1988, 1990, 1991,1992 and for Italy, the findings were supplied by the National Statistics Office - N.S.O. (compiled by ISTMA). For 1990 and for Netherlands, the findings were supplied by the N.S.O.
(2) Data supplied by CEFAMOL
(3) Estimated value for 1988 for US and for 1995 for Great Britain
(4) For 1989, firms with less than 20 employees were not included
(5) It includes the production in plants of integrated tools in the automobile and plastic industries for 1989 for Sweden and for 1995 for Germany
(6) West Germany, for 1988, 1989
(7) For 1996 for Korea it includes other dies and moulds

For the period 1994-1998 (Figure 2G3c) the USA clearly led the imports value, and was followed by Germany in second place and Canada in third. It is interesting to note that all these three countries increased their imports in 1998, compared to previous period, accounting the USA the most remarkable growth.

Figure 2G3c - Imports, 1988-1998, (Euros 10^3)



Source: ISTMA
(2) Data supplied by CEFAMOL
(3) Estimated value for 1995 for Great Britain
(5) It includes the production in plants of integrated tools in the automobile and plastic industries for 1995 for Germany
(7) For 1996 for Korea it includes other dies and moulds

Appendix 2G4 - ISTMA comparative statistics: Business ratios

Investment in new technologies as % of turnover

During the decade, 1988-1998, the investment in technology as percentage of turnover, on average, increased (see Table 2G4a). In 1988 Portugal accounted for the highest percentage of investment. Portugal is well known for the heavy investments in technology and for constantly update their equipment. Portugal was followed by France and Spain in second and third place, respectively. Among the countries, which presented the lowest percentage in investment in new technologies, were Germany, the USA and Japan. It is interesting to note that the countries that led the turnover or exports, such as the USA, Japan and Germany were those that presented the lowest investment values. Ten years later, in 1998 Great Britain leads the investments in new technologies. Spain and Portugal followed Great Britain in second and third place respectively. It is interesting to note that, for the decade 1998-1998, Portugal, on average, always occupied the first three positions of the countries, which invested most, with investment values always above the ISTMA average. Conversely, the USA always had been among the countries with the lowest percentage in investments.

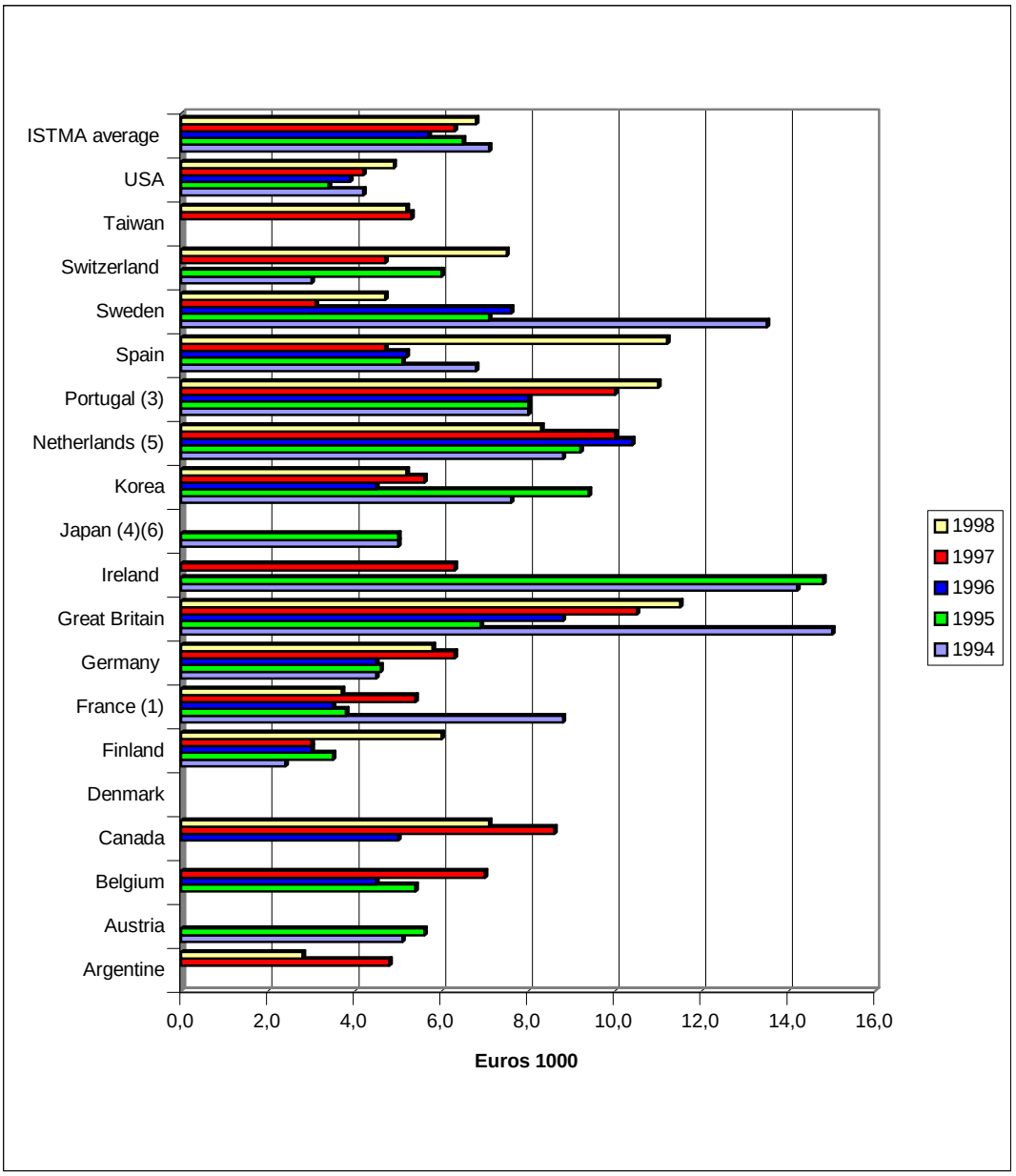
Table 2G4a - Investments in new technologies as % of turnover, 1988-1998

Countries	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentine										4,8	2,8
Austria						5,0	5,1	5,6			
Belgium (7)		10,0	9,0	7,0	4,0			5,4	4,5	7,0	
Canada									5,0	8,6	7,1
Denmark				2,5							
Finland	7,0	7,1	4,5	2,3	1,8	1,2	2,4	3,5	3,0	3,0	6,0
France (1)	11,2	7,9	12,4	7,8	7,0	8,8	8,8	3,8	3,5	5,4	3,7
Germany (2)	3,3	4,5	6,3	4,9	4,7	5,2	4,5	4,6	4,5	6,3	5,8
Great Britain	7,4	6,0	3,5	4,0	6,7	7,2	15,0	6,9	8,8	10,5	11,5
Ireland				3,9	13,0	16,0	14,2	14,8		6,3	
Japan (4)(6)	5,4	5,3	5,0	5,0	6,1	5,0	5,0	5,0			
Korea	8,1	18,7	15,2	7,0	4,5	11,0	7,6	9,4	4,5	5,6	5,2
Netherlands (5)	6,7				5,0	7,9	8,8	9,2	10,4	10,0	8,3
Portugal (3)	22,0	16,5	15,7	10,0	11,0	10,0	8,0	8,0	8,0	10,0	11,0
Spain	11,0	9,8	8,5	7,4	3,2	2,2	6,8	5,1	5,2	4,7	11,2
Sweden (8)	13,0	7,3					13,5	7,1	7,6	3,1	4,7
Switzerland	6,0	10,0	10,0	6,0	5,0	4,6	3,0	6,0		4,7	7,5
Taiwan										5,3	5,2
USA	5,5	5,1	3,8	3,7	3,7	3,9	4,2	3,4	3,9	4,2	4,9
ISTMA average	8,6	9,0	7,2	5,1	5,4	6,3	7,1	6,5	5,7	6,3	6,8

Source: ISTMA
(1) The value for France includes moulds and stamping dies-special tooling:
- For 1988 it includes moulds=7,4% and stamping dies-special tooling =3,8%; total =11,2%,
- For 1990 it includes moulds=7,4% and stamping dies-special tooling =5,0%; total =12,4%,
- For 1991it includes moulds=5,1% and stamping dies-special tooling =2,7%; total =7,8%,
- For 1992 it includes moulds=4,7% and stamping dies-special tooling =2,3%; total =7,0%,
- For 1993 it includes moulds=5,2% and stamping dies-special tooling =3,6%; total =8,8%,
- For 1994 it includes moulds=5,8% and stamping dies=3,0%; total =8,8%
(2) West Germany, 1988, 1989, 1990
(3) only moulds
(4) For 1992 for Japan only 27 firms have participated
(5) For 1992 for Netherlands only 5 firms have participated
(6) For 1993, 1994, 1995 for Japan, an estimated value
(7) For 1995 for Belgium only 4 firms have participated, for 1996 and 1997 for Belgium limited number of answers
(8) For 1997 for Sweden only 2 firms have participated
Note: it may happen that the findings after 1994 for France only include moulds as they have similar trend in previous period, however nothing is said

From 1994 to 1998 (see Figure 2G4a) Great Britain, Netherlands and Portugal were the countries that invested most in new technologies, achieving values always above the ISTMA average. In opposition the USA for this period presented values significantly below to the ISTMA average. From 1997 to 1998 Spain accounted for the highest growth and Argentine for the highest decline in investments in new technologies.

Figure 2G4a - Investments in new technologies as % of turnover, 1994-1998



Source: ISTMA
(1) The value for France for 1994 includes moulds and stamping dies, i.e. moulds=5,8% and stamping dies =3,0%; total =8,8%
(3) Only moulds
(6) For 1994, 1995 for Japan, an estimated value
(7) For 1995 for Belgium only 4 firms have participated, for 1996 and 1997 for Belgium limited number of answers
(8) for 1997 for Sweden only 2 firms have participated

Liquidity ratio

For 1988 to 1998 the liquidity ratio was 1,42 (see ISTMA average, Table 2G4b), which according to the literature is satisfactory (above 1,00, but bellow 2,00 - which is a good value for liquidity ratio - see definition in appendix 2G1). Portugal has been below the ISTMA average liquidity ratio (on average, 1,06). In 1988, Spain accounted for the highest liquidity ratio (2,00). Spain was managing well their investments (short term liabilities) as well as their assets (their capability of generate short-term assets). Great Britain and Spain were followed in second place by Japan and Sweden (1,90) and in third place by the USA (1,80). Among the countries which presented the lowest liquidity ratio were Portugal (0,90) in first, Finland and France (1,00) in second and Switzerland (1,10) in third place. The value presented by Portugal translates any fragility in generating financial outcomes to cover short-term liabilities, i.e. indicates low productivity levels. Portugal accounted for the highest percentage in terms of investments, however compromised their assets. Is important that it continues to invest, but is also important that assures productivity and consequently, profitability. In 1998, Switzerland (2,60), Canada (2,35) and Spain (2,15) respectively, accounted for the highest liquidity ratio values. France (0,79) Belgium (0,90) and Finland (1,00) presented the lowest values.

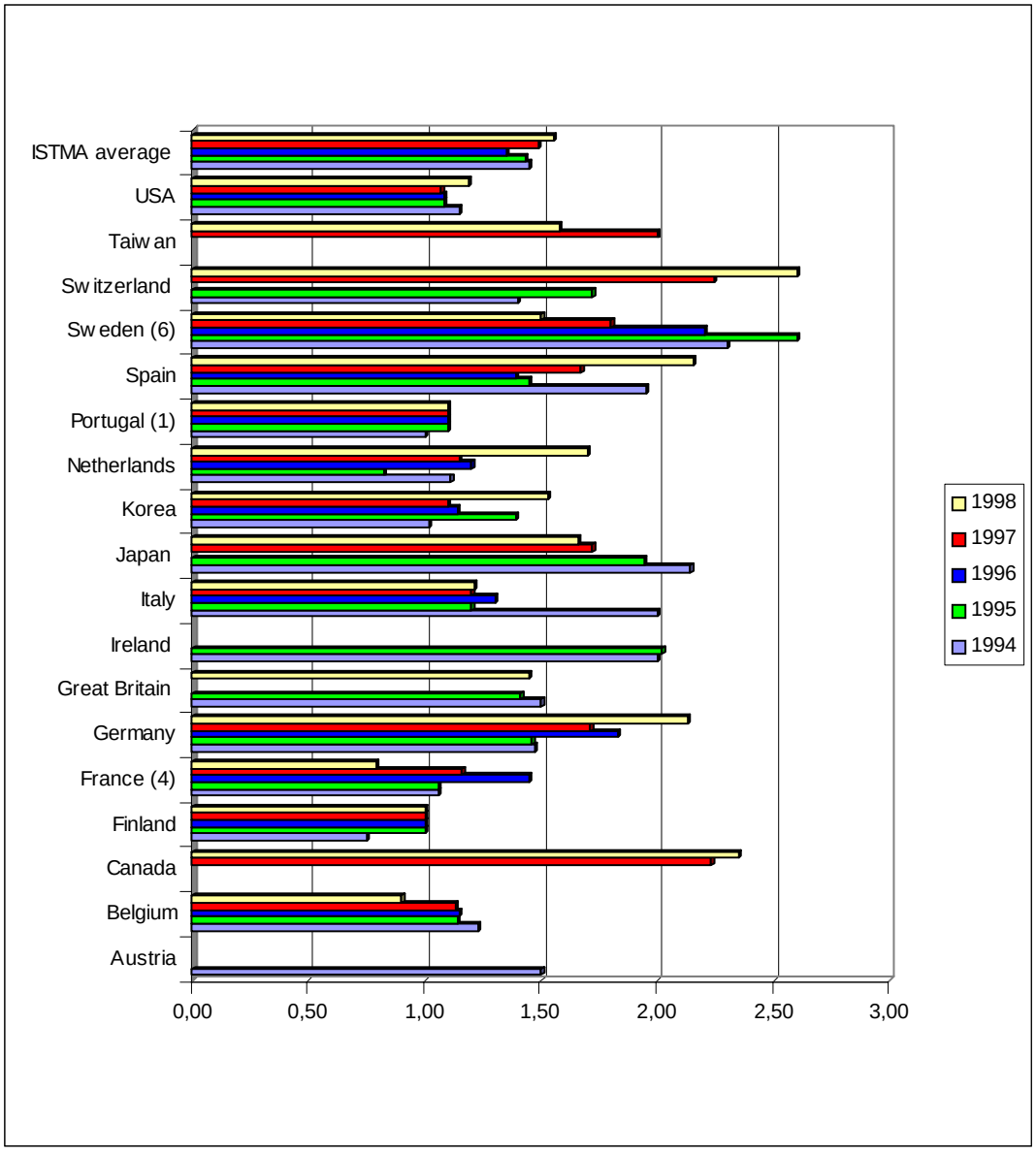
Table 2G4b - Liquidity ratio, 1988-1998

Countries	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Austria						2,00	1,50				
Belgium	1,20	1,10	1,14	1,23	1,36	1,20	1,23	1,14	1,15	1,13	0,90
Canada										2,23	2,35
Finland	1,00	1,20	1,20	0,80	0,70	0,70	0,75	1,00	1,00	1,00	1,00
France (1)(4)	1,00	1,10	0,92	1,04	1,59	1,31	1,06	1,06	1,45	1,16	0,79
Germany (2)	1,70	1,50	1,60	1,38	1,08	1,28	1,47	1,46	1,83	1,71	2,13
Great Britain	2,00	1,30	0,95	1,13	1,31	1,00	1,50	1,41			1,45
Ireland				1,09	1,38	2,14	2,00	2,02			
Italy		1,60	1,50	1,80	1,80	1,60	2,00	1,20	1,30	1,20	1,21
Japan	1,90	2,00	1,89	1,78	1,68	1,69	2,14	1,94		1,72	1,66
Korea	1,70	1,60	1,54	1,24	1,05	1,03	1,02	1,39	1,14	1,10	1,53
Netherlands (5)					1,63	1,62	1,11	0,82	1,20	1,15	1,70
Portugal (1)	0,90	1,10	1,10	1,10	1,10	1,00	1,00	1,10	1,10	1,10	1,10
Spain	2,00	2,10	2,09	1,82	1,80	1,40	1,95	1,45	1,39	1,67	2,15
Sweden (3)(7)	1,90	1,30					2,30	2,60	2,20	1,80	1,50
Switzerland	1,10	1,20	1,60	1,30	1,30	1,55	1,40	1,72		2,24	2,60
Taiwan										2,00	1,58
USA	1,80	1,80	1,19	1,21	1,19	1,14	1,15	1,08	1,08	1,07	1,19
ISTMA average	1,50	1,50	1,36	1,28	1,37	1,37	1,45	1,43	1,35	1,49	1,55

Source: ISTMA
(1) Only moulds, for Portugal for 1988 to 1998 and for France, for 1988 and 1989
(2) West Germany, 1988, 1989, 1990
(3) For 1989 for Sweden owned shops included
(4) The value for France includes moulds and stamping dies-special tooling:
- For 1990 it includes moulds=1,1 and stamping dies-special tooling =0,73; total =1.83/2=0,915,
- For 1991it includes moulds=1,01 and stamping dies-special tooling =1,06; total =2,07/2=1,035,
- For 1992 it includes moulds=1,20 and stamping dies-special tooling =1,98; total =3,18/2=1,59
- For 1993 it includes moulds=1,20 and stamping dies =1,42; total =2,62/2=1,31
- For 1994 it includes moulds=1,13 and stamping dies =0,098; total =2,11/2=1,055
(5) For 1992 for Netherlands only 5 firms have participated
(6) For 1997 for Sweden only 2 firms have participated
Note: it may happen that the findings after 1994 for France only include moulds as they have similar trend in previous period, however nothing is said

For the period 1994-1998 the USA, Portugal, Italy and Finland had a relative stable trend in terms of their liquidity ratio (see Figure 2G4b). They accounted for a satisfactory ratio (i.e. superior or equal to 1), however, below of the ISTMA average. These countries revealed that they have not being able of generating more than a satisfactory short-term asset to cover short-terms liabilities. Countries such as Switzerland, Spain, Netherlands, Korea and Germany had a significant growth from 1997 to 1998, with Switzerland, Spain and Germany having a ratio superior to 2,00.

Figure 2G4b - Liquidity ratio, 1994-1998



Source: ISTMA
(1) Only moulds
(4) The value for 1994 for France includes moulds and stamping dies, i.e. moulds=1,13 and stamping dies=098; total =2,11/2=1,055
(6) For 1997 for Sweden only 2 firms have participated

Net profit before taxes as % of turnover

The increased worldwide competition forced firms to reduce their profit margins, on average, the net profit before taxes, during 1988-1998 declined (see Table 2G4c). In 1988, Spain, Great Britain and France had the highest percentage of net profit before taxes (is interesting to note that Great Britain and Spain also presented the highest liquidity ratio) and Finland, Switzerland and the USA the lowest (however, the USA has the highest turnover, suggesting a profitability problem). Ten years later, in 1998, Canada, Great Britain and Switzerland were the countries with the highest net profit before taxes. Is suggested that these mould makers may be producing moulds for a market niche (i.e. of specific characteristics) in which, a premium price can be charged. Belgium, Portugal, Argentine and Germany accounted for the lowest percentage of net profit before taxes. This shows that Portugal needs to make an effort to increase its profitability and value added, which could be achieved through mould production specialisation and the enlargement of the value chain.

Table 2G4c - Net profit before taxes as % of turnover, 1988-1998

Countries	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Argentine										4,40	2,10
Austria						4,00	3,50	4,40			
Belgium	8,80	5,10	4,43	2,55	0,30	-1,54	-2,03	1,00	2,10	1,40	-0,80
Canada									13,60	13,30	12,20
Denmark				3,30							
Finland	2,40	2,60	1,60	1,10	0,50	0,80	1,00	5,00	6,00	6,00	6,00
France (1)	8,90	2,90	5,20	7,45	6,69	6,30	9,56	3,80	3,31	3,30	3,20
Germany (2)	4,90	5,40	5,94	2,45	-3,00	-0,99	0,23	-0,98	0,91	4,83	2,10
Great Britain	10,60	3,80	1,35	10,30	8,28	5,42	18,30	10,22	10,04	16,00	10,70
Ireland				11,82	8,17	6,00	16,13	13,00			
Italy		5,80	5,40	4,00	4,00	4,90	5,00	4,90	5,00	4,30	5,00
Japan	5,70	7,60	7,40	8,20	8,20	6,60	8,10	8,40		6,50	7,30
Korea	5,60	5,50	5,40	5,20	4,90	5,50	5,70	4,29	4,20	4,70	6,10
Netherlands (5)	4,50				8,10	3,80	7,54	6,90	7,10	5,04	6,30
Portugal (3)	7,50	7,30	6,90	6,10	4,50	4,50	5,50	5,30	6,00	6,50	1,50
Spain	10,70	8,90	6,20	5,92	3,69	3,50	4,70	5,75	5,54	4,67	5,60
Sweden (4)(6)	6,20	8,00					7,70	3,70	4,10	5,20	5,10
Switzerland	4,00	6,50	5,40	1,50	4,00	2,90	2,40	8,00		9,28	9,90
Taiwan										6,70	6,90
USA	4,40	5,40	4,10	4,10	2,60	3,70	4,80	4,90	5,20	5,40	4,80
ISTMA average	6,20	5,80	4,56	4,93	4,06	3,46	5,77	5,54	5,62	6,32	5,50

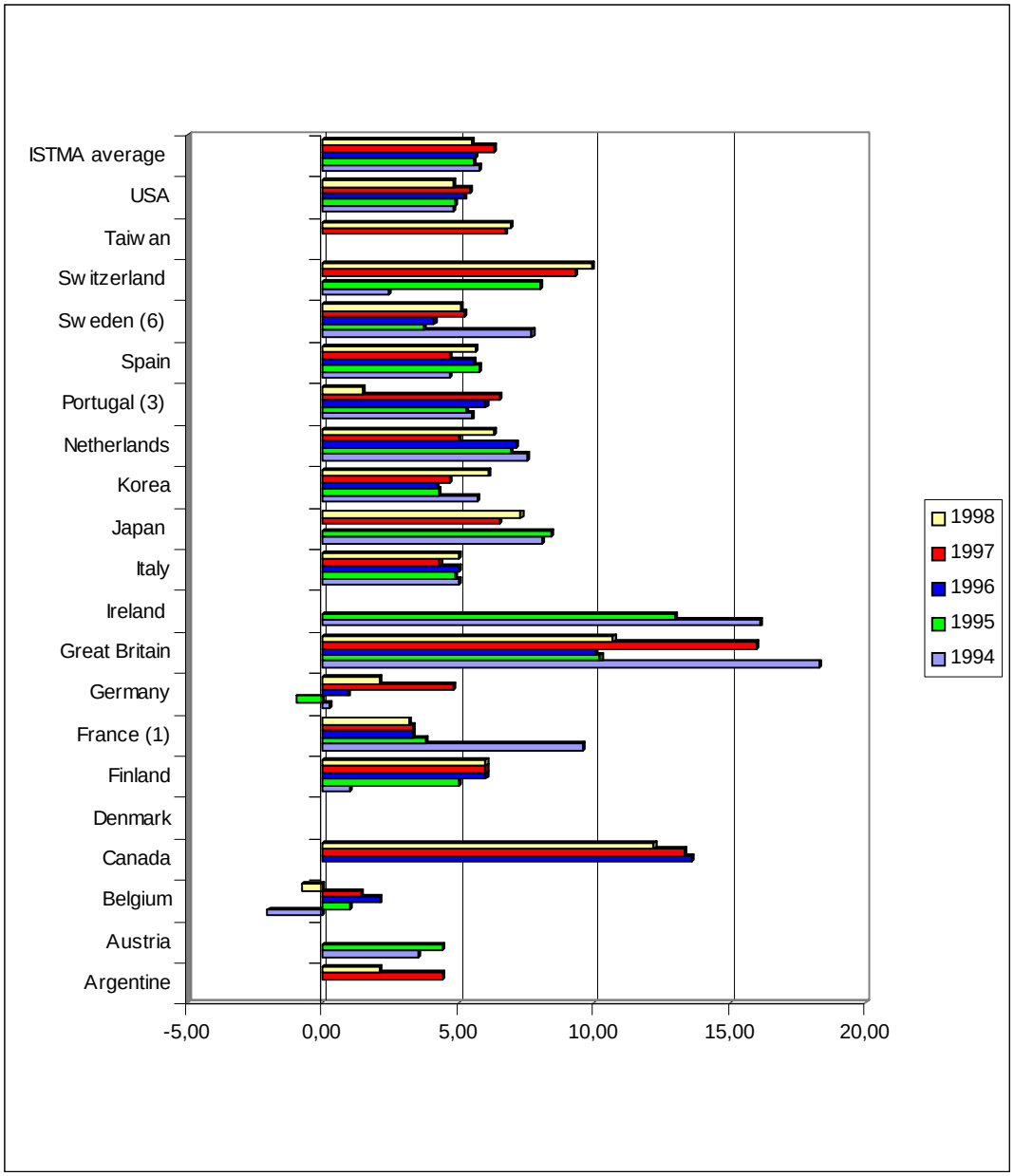
Source: ISTMA

(1) The value for France includes moulds and stamping dies-special tooling:
- For 1988 it includes moulds=5,4% and stamping dies-special tooling =3,5%; total =8,9%,
- For 1990 it includes moulds=3,2% and stamping dies =2,0%; total =5,2%,
- For 1991 it includes moulds=4,17% and stamping dies =3,28%; total =7,45%,
- For 1992 it includes moulds=3,53% and stamping dies =3,16%; total =6,69%,
- For 1993it includes moulds=1,27% and stamping dies =5,03%; total =6,3%,
- For 1994 it includes moulds=3,58% and stamping dies =5,98%; total =9,56%

(2) West Germany, 1988, 1989, 1990
(3) Only moulds
(4) For 1989 for Sweden owned shops included
(5) For 1992 for Netherlands only 5 firms have participated
(6) For 1997 for Sweden only 2 firms have participated
Note: it may happen that the findings after 1994 for France only include moulds as they have similar trend in previous period, however nothing is said

For 1994 to 1998 (see Figure 2G4c) Canada and Great Britain, were the countries, with the highest levels of net profit before taxes (superior to 10%). Interesting is also to note that from 1997 to 1998, Korea was the country that growth most and Portugal the one that decreased most. This Portuguese decline could underline an increasing competition from the Asian Tiger countries. Yet, with the exception 1998, Portugal always accounted for values above the ISTMA average. Other important aspect to emphasise is that the USA, Italy and France for all the period 1994-1998 have, on average, presented values below the ISTMA average. It can be suggested that at the same time that the worldwide mould production is increasing the mould makers' profit margins are decreasing.

Figure 2G4c - Net profit before taxes as % of turnover, 1994-1998



Source: ISTMA
(1) The value for France for 1994 includes moulds and stamping dies, i.e. moulds=3,58% and stamping dies =5,98%; total =9,56%
(3) Only moulds
(6) For 1997 for Sweden only 2 firms have participated

Value of subcontracting as % of turnover

From Table 2G4d the subcontracting value accounted for relatively stable values. Portugal for the period accounted always for values above the ISTMA average. In 1989, France (19.9%), Japan (15.7%) and Korea (13.7%) presented the highest percentage in terms of subcontracting. A possible explanation could be that most of the firms of these countries are small and medium firms and therefore, do not own all the technology to complete the manufacture process, so subcontract. In 1998, Korea has far and foremost accounted for the highest percentage of the subcontracting value (22.9%). This percentage could underline the rapid growth of the Korean mould makers, which may found in the subcontracting business a way of respond to the increased Korean mould demand. Korea was followed by Portugal (15.0%) and Italy (13.0%), in second and third place respectively. It is also important to emphasise, that contrary to what happens in other countries, where the employees are polyvalent, in Portugal the manufactured mould process work is specialised and therefore is easy to identify the tasks to be subcontracted. In opposition, both for 1988 and 1998, Belgium and Great Britain were among the countries that accounted for the lowest percentage of subcontracting value. It may happen that in these countries, firms own all the technology of the manufactured process and therefore do not need to subcontract.

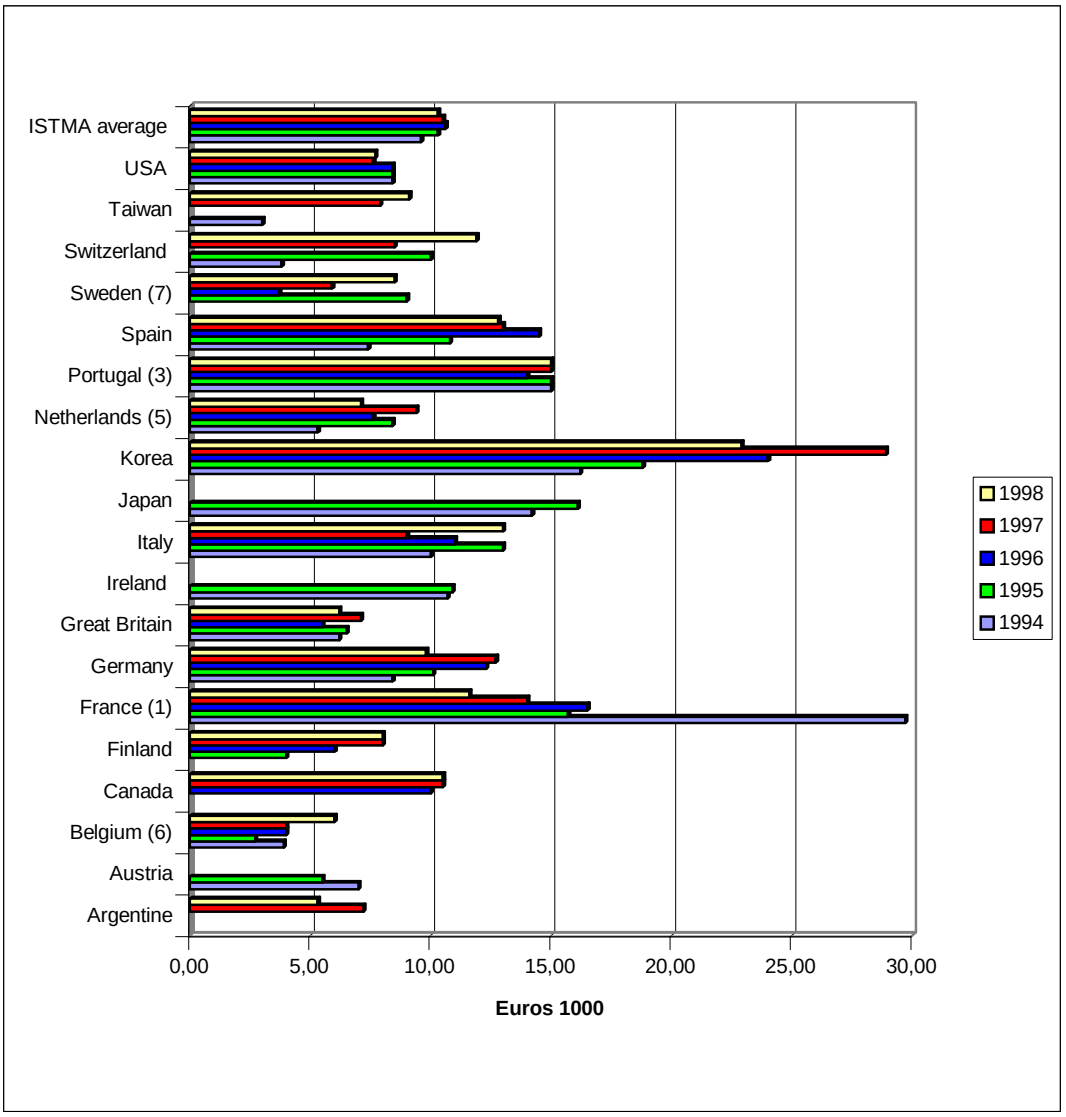
Table 2G4d - Value of subcontracting as % of turnover, 1988-1998

Countries	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentine										7,20	5,30
Austria						11,00	7,00	5,50			
Belgium (4)(6)	2,30	9,00	4,00	3,50	3,20		3,90	2,70	4,00	4,00	6,00
Canada									10,00	10,50	10,50
Finland	6,00	5,00	4,00	2,80	2,20	2,80		4,00	6,00	8,00	8,00
France (1)	19,90	16,80	34,10	32,50	26,40	25,80	29,70	15,70	16,50	14,00	11,60
Germany (2)	4,30	6,30	8,50	6,50	8,40	8,00	8,40	10,10	12,30	12,70	9,80
Great Britain	5,20	7,00	0,70	5,30	7,60	6,60	6,20	6,50	5,50	7,10	6,20
Ireland				4,00	13,10	11,00	10,70	10,90			
Italy		8,00	7,00	9,00	11,00	12,10	10,00	13,00	11,00	9,00	13,00
Japan	15,70	18,60	17,40		18,10	14,60	14,20	16,10			
Korea	13,70	14,20	14,70	14,20	15,10	15,40	16,20	18,80	24,00	28,90	22,90
Netherlands (5)	7,70				6,60	5,80	5,30	8,40	7,60	9,40	7,10
Portugal (3)	12,00	15,20	15,50	15,00	14,00	14,00	15,00	15,00	14,00	15,00	15,00
Spain	10,80	10,40	13,50	16,00	9,70	9,40	7,40	10,80	14,50	13,00	12,80
Sweden (7)								9,00	3,70	5,90	8,50
Switzerland	9,00	10,00	12,00	12,00	7,00	11,90	3,80	10,00		8,50	11,90
Taiwan							3,00			7,90	9,10
USA		2,00	7,60	7,50	7,50	8,50	8,40	8,40	8,40	7,60	7,70
ISTMA average	9,70	10,20	10,70	10,40	10,00	10,50	9,60	10,30	10,60	10,50	10,30

Source: ISTMA
(1) The value for France includes moulds and stamping dies and special tooling:
- For 1990 it includes moulds=19,1% and stamping dies =15,0%; total =34,1%,
- For 1991it includes moulds=14,7% and stamping dies =17,8%; total =32,5%,
- For 1992 it includes moulds=13,1% and stamping dies =13,3%; total =26,4%,
- For 1993 it includes moulds=11,1% and stamping dies =14,7%; total =25,8%,
- For 1994 it includes moulds=11,2% and stamping dies =18,5%; total =29,7%
(2) West Germany, 1988, 1989, 1990
(3) Only moulds, for Portugal for 1988 to 1998 and for France for 1988 and 1989
(4) For 1990 and 1991 for Belgium an estimated value
(5) For 1992 for Netherlands only 5 firms have participated
(6) For 1994, 1997 for Belgium a limited number of answers for 1995 for Belgium only 4 firms have participated
(7) For 1997 for Sweden only 2 firms have participated
Note: it may happen that the findings after 1994 for France only include moulds as they have similar trend in previous period, however nothing is said

For 1994-1998 Korea accounted for the highest, subcontracting value, i.e. more than 20% of its turnover (see Figure 2G4d), nonetheless, Korea was also the country, which registered the highest decrease subcontracting value from 1997 to 1998, in opposition to Switzerland, Sweden, Belgium and Italy that increase it considerably. Spain, Canada and Portugal registered values above the ISTMA average, among this group Portugal accounted for the highest percentage.

Figure 2G4d - Value of subcontracting as % of turnover, 1994-1998



Source: ISTMA
(1) The value for France for 1994 includes moulds and stamping dies, i.e. moulds=11,2% and stamping dies =18,5%; total =29,7%
(3) Only moulds
(6) For 1994, 1997 for Belgium a limited number of answers, for 1995 for Belgium only 4 firms have participated
(7) For 1997 for Sweden only 2 firms have participated

Appendix 2G5 - ISTMA comparative statistics: Employees' ratios

Turnover per employee

For all the decade (1988-1998), as it happened with the ISTMA countries, on average, Portugal continuously increased its turnover per employee, however, its values were far below of ISTMA average (see Table 2G5a). In 1988 Japan, Switzerland and France were among the countries, with the highest levels of productivity, i.e. presented the highest values of turnover per employee. Portugal accounted for the lowest value, and was followed by Korea and Finland, in second and third place respectively. Portugal is one of the countries that invests most in new technologies, but has the lowest productivity levels. The values obtained by Portugal and Korea did not differ much; nonetheless, they represent half of the value achieved by Finland. In 1998, Japan and Switzerland maintained the first and the second position respectively, among the countries, which accounted for the highest values of turnover per employee. France, which occupied the third place in 1988, was switched by Italy in 1998. Portugal, in 1998 continues to present the lowest value of turnover per employee. The Portuguese findings revealed that for the decade the Portuguese mould makers were not able to solve the low levels of productivity. It is desirable and needed that they will do it for the coming years.

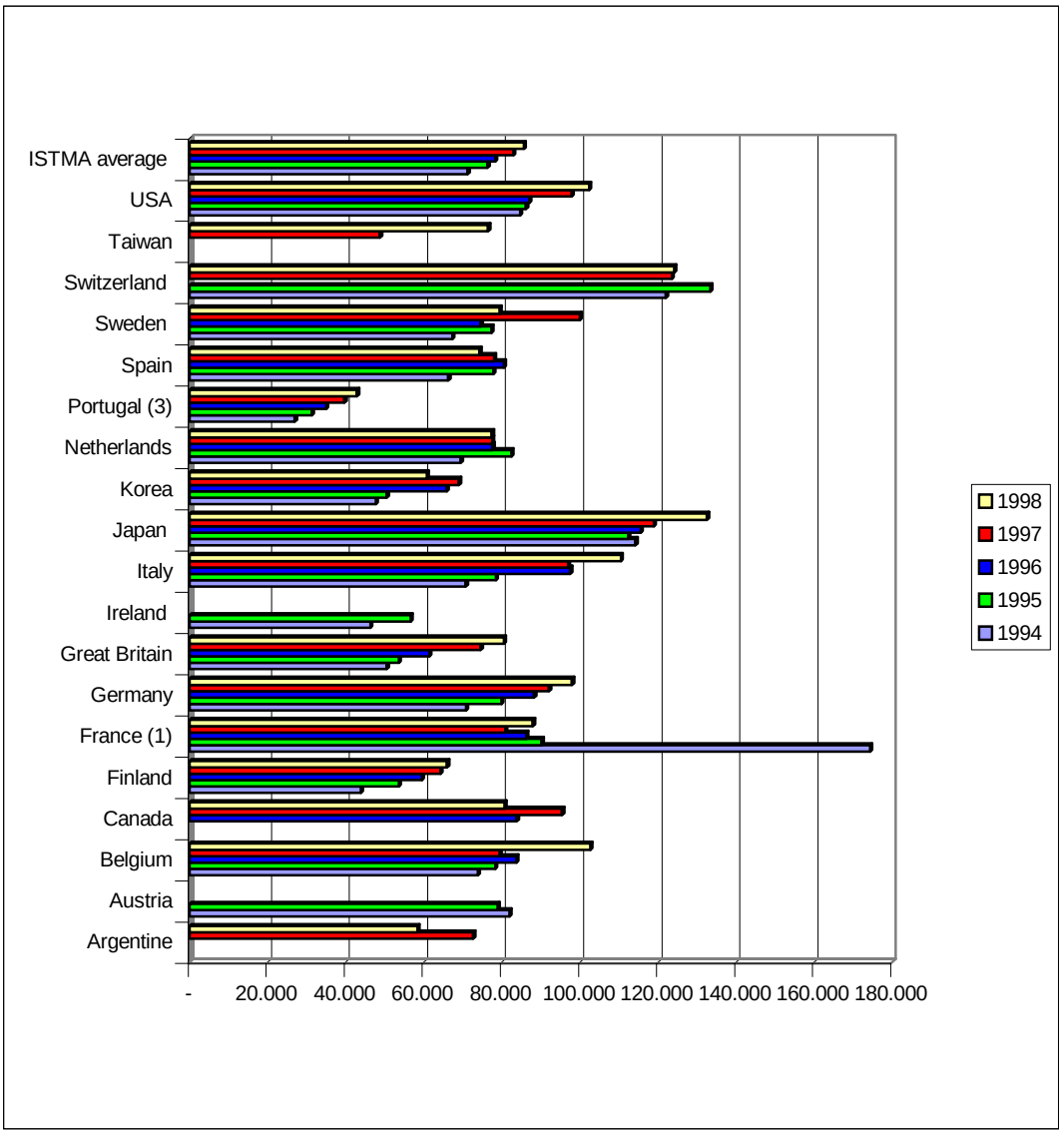
Table 2G5a - Turnover per employee, 1988-1998, (Euros)

Countries	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentine										72.656	58.438
Austria						88.081	81.982	78.893			
Belgium	59.187	75.611	79.669	78.630	81.263	82.033	73.884	78.336	83.718	79.441	102.681
Canada									83.776	95.421	80.726
Finland	46.529	46.822	47.423	45.981	37.885	38.828	43.936	53.604	59.538	64.279	65.940
France (1)(3)	71.599	72.875	148.380	140.194	141.465	168.699	174.318	90.158	86.264	80.853	87.907
Germany (2)	54.747	58.828	67.672	59.724	65.423	66.789	70.857	79.903	88.261	92.085	97.963
Great Britain	54.508	50.487	43.128	53.936	49.833	48.206	50.546	53.578	61.401	74.576	80.562
Ireland				33.554	47.008	42.618	46.307	56.690			
Italy		70.771	72.274	75.657	73.958	70.605	70.755	78.492	97.501	96.926	110.486
Japan	86.546	102.178	81.215	101.758	99.353	127.133	114.184	112.379	115.589	118.911	132.525
Korea	21.906	28.633	28.803	34.028	30.208	42.341	47.682	50.515	65.889	68.959	60.815
Netherlands	55.807				68.846	65.247	69.442	82.483	77.607	77.517	77.419
Portugal (3)	15.576	18.090	21.043	22.031	24.325	24.155	26.918	31.361	34.992	39.680	42.883
Spain	52.576	55.993	59.624	66.389	76.609	68.914	66.300	77.824	80.540	78.008	74.213
Sweden (4)	68.201	95.317					67.336	77.369	74.577	99.986	79.377
Switzerland	75.231	92.818	88.068	82.936	74.817	87.749	122.007	133.363		123.489	124.202
Taiwan										48.732	76.455
USA	63.238	76.430	67.080	72.589	72.931	86.147	84.646	86.190	87.085	97.904	102.363
ISTMA average	55.819	64.989	61.798	62.784	61.469	69.222	71.241	76.321	78.338	82.907	85.586

Source: ISTMA
(1) The value for France, includes moulds and stamping dies:
- For 1990 it includes moulds=75.064 and stamping dies =73.316, total =148.380,
- For 1991, it includes moulds=74.659 and stamping dies =65.535, total =140.194
- For 1992 it includes moulds=76.864 and stamping dies =64.601, total =141.465
- For 1993, it includes moulds=80.625 and stamping dies =88.074, total =168.699
- For 1994, it includes moulds=84.646 and stamping dies =87.036, total =174.318
(2) West Germany, 1988, 1989, 1990
(3) Only moulds, for Portugal for 1988-1998, and for 1989 for France
(4) The value for 1989 for Sweden includes owned shops
Note: it may happen that the findings after 1994 for France only include moulds as they have similar trend in previous period, however nothing is said

From Figure 2G5a, Switzerland, Japan, Italy, USA, Germany, France and Belgium are among those countries with the highest levels of turnover per employee (high productivity levels). This suggests that they have highly computerized (automated) manufactured processes. From 1997 to 1998 Taiwan, Belgium, Japan and Italy were among the countries that increased most their turnover per employee. The Taiwanese growth may be explained by the reduced number of employees per firm, and the employees' long hours of work (e.g.16 hour a day). For the period 1994-1998, Portugal turnover per employee has gradually increased however, still significantly lower than the ISTMA average value.

Figure 2G5a - Turnover per employee, 1994-1998, (Euros)



Source: ISTMA
(1) The value for France for 1994 includes moulds=84.646, and stamping dies =87.036 total =174.318
(3) Only moulds

Added value per employee

With the exception from 1989 to 1990, the added value per employee for the ISTMA associated countries increased (see Table 2G5b). Portugal followed the same growth trend, however with values far below of the ISTMA average, representing less than haft of the average value. In 1988,

France, Switzerland and Belgium accounted for the highest added value per employee. In 1998, Japan, USA and Switzerland did. Portugal led both in 1988 and 1998 the countries with the lowest added value. A possible explanation, and compared with others European countries, could be the high number of Portuguese employees by firm (on average, 30 employees by firm) as a result of their specialised work in the manufacturer process.

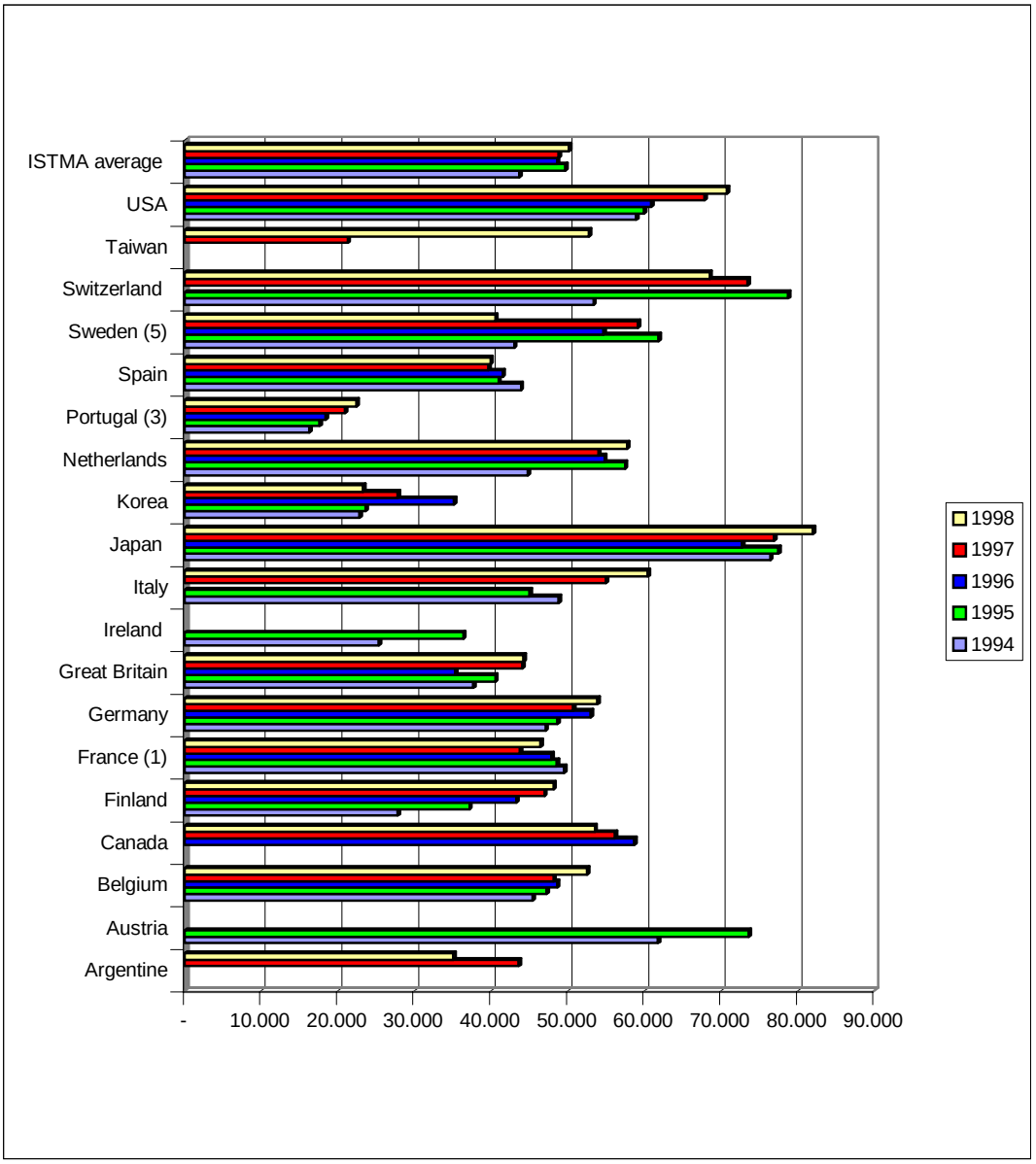
Table 2G5b - Added value per employee, in Euros, 1988-1998, (Euros)

Countries	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentine										43.593	35.027
Austria						60.923	61.745	73.583			
Belgium	37.539	44.952	48.320	48.078	44.959	46.453	45.390	47.209	48.602	48.109	52.493
Canada									58.643	56.128	53.484
Denmark				36.732							
Finland	26.299	26.691	29.278	28.388	25.831	24.641	27.783	37.137	43.238	46.934	48.109
France (1)(3)	72.697	44.648	80.704	80.626	85.519	87.908	88.962	48.542	47.829	43.715	46.428
Germany (2)	36.772	36.117	38.798	37.876	42.385	43.019	47.089	48.661	52.962	50.666	53.841
Great Britain	37.411	30.400	25.750	38.273	32.483	33.847	37.675	40.543	35.291	44.060	44.235
Ireland				16.908	24.306	26.921	25.327	36.367			
Italy		52.301	53.220	53.482	53.275	52.682	48.771	45.021	55.642	54.942	60.406
Japan	33.165	36.363	29.860	68.567	65.167	91.028	76.400	77.456	72.724	76.898	81.950
Korea	10.282	13.642	14.184	16.520	14.545	20.394	22.784	23.593	35.119	27.789	23.299
Netherlands	32.251			21.766	40.098	44.840	44.785	57.431	54.763	53.968	57.731
Portugal (3)	9.647	11.092	12.760	13.218	14.881	15.050	16.252	17.593	18.390	20.897	22.439
Spain	27.858	31.447	34.526	43.283	43.896	33.339	43.857	40.932	41.478	39.605	39.896
Sweden (4)(5)	36.852	36.514					42.999	61.831	54.611	59.125	40.538
Switzerland	42.245	52.486	49.432	47.392	48.411	48.852	53.339	78.729		73.456	68.502
Taiwan										21.260	52.762
USA	35.666	51.514	43.401	49.215	49.301	58.321	58.914	59.902	60.873	67.848	70.732
ISTMA average	31.505	36.244	35.402	37.520	39.004	43.014	43.651	49.658	48.583	48.764	50.110

Source: ISTMA
(1) The value for France, includes moulds and stamping dies-special tooling:
- For 1988 it includes moulds=43.576 and stamping dies-special tooling =29.121, total =72.697
- For 1990, it includes moulds=42.377 and stamping dies =38.327, total =80.704,
- For 1991 it includes moulds=41.333 and stamping dies =39.293, total =80.626
- For 1992 it includes moulds=45.219 and stamping dies =40.300, total =85.519
- For 1993it includes moulds=42,019 and stamping dies =45.889, total =87.908
- For 1994 it includes moulds=49.847 and stamping dies =39.115, total =88.962
(2) West Germany, 1988, 1989, 1990
(3) Only moulds, for Portugal for 1988-1998 and for 1989 for France
(4) The value for 1989 for Sweden includes owned shops
(5) For 1997 for Sweden only two firms have participated
Note: it may happen that the findings after 1994 for France only include moulds as they have similar trend in previous period, however nothing is said

For the period 1994-1998, three countries can be distinguished, i.e. Japan, Switzerland, and the USA; they presented significant values above the ISTMA average (see Figure 2G5b). Portugal has been gradually increasing its added value per employee, however is still far below the ISTMA average, accounting for this period for the lowest value. The countries, which registered the highest growth from 1997 to 1998, were Taiwan, Japan and Italy respectively.

Figure 2G5b - Added value per employee, 1994-1998, (Euros)



Source: ISTMA
(1) The value for France for 1994 includes moulds =49.847 and stamping dies =39.115, total =88.962

(3) Only moulds
(5) For 1997 for Sweden only two firms have participated

Employees' total cost as % of turnover

For the decade, on average, the employees' total cost as percentage of turnover decreased (see Table 2G5c). Portugal followed the same trend, however accounted for values below the ISTMA average. In 1988, Finland (57%), Germany (52,2%) and the USA (50%) had the highest employee's costs and Portugal (37%), Sweden (37,2%) and France (43,8%) the lowest. Ten years later, in 1998, Finland (57%), Sweden (50,4%), USA and Japan (48,2%) are the countries with the highest costs. Portugal that in 1988 had the lowest employee total cost, in 1998 was the third country (36%) with the lowest wages, suggesting that labour costs in Portugal increased. Korea and Taiwan occupied the first (23%) and the second position (35,8%). Nonetheless, Portugal is still the country in Europe with the lowest employees' total costs. Is suggested that some of the Korean, Taiwanese and Portuguese mould makers' price competitiveness may rely on their low employee total costs. Is interesting to note that, for the decade, contrary to what would be expected, the employee' total cost decreased. Firms tend to have more qualified but fewer employees, as technology replaces human resources.

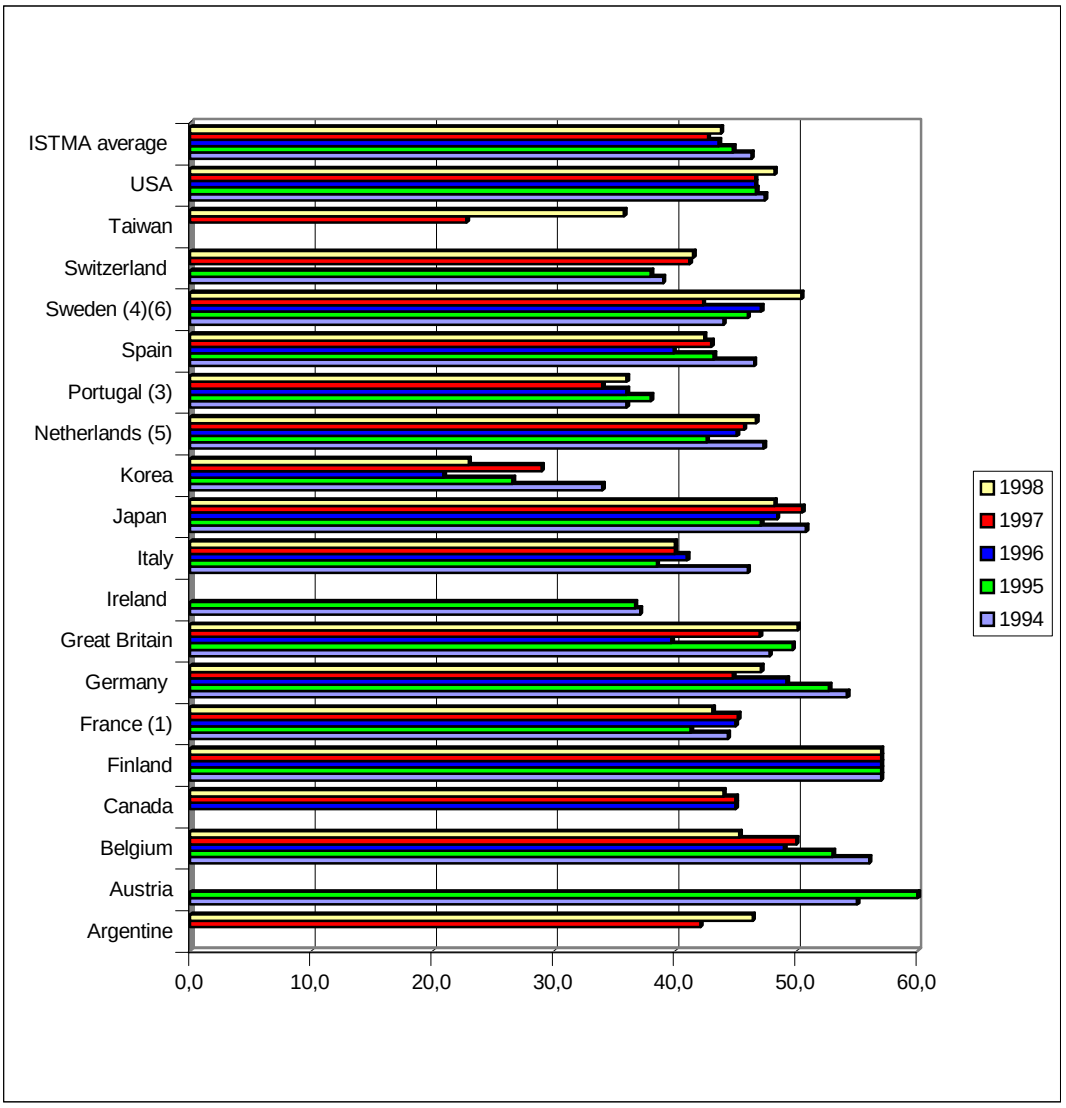
Table 2G5c - Employees' total cost as % of turnover, 1988-1998

Countries	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentine										42,1	46,4
Austria						52,0	55,0	60,0			
Belgium	48,0	41,0	42,0	44,0	48,0	50,0	56,0	53,0	49,0	50,0	45,3
Canada									45,0	45,0	44,0
Finland	57,0	56,4	57,4	64,8	64,8	58,0	57,0	57,0	57,0	57,0	57,0
France (1)(3)	43,8	48,9	46,5	49,9	46,5	45,6	44,4	41,3	45,0	45,2	43,1
Germany (2)	52,2	50,4	49,5	53,8	55,1	55,5	54,2	52,7	49,2	44,8	47,1
Great Britain	46,7	48,9	52,0	47,9	48,0	56,5	47,8	49,7	39,7	47,0	50,1
Ireland				41,9	36,0	40,5	37,1	36,7			
Italy		39,0	42,5	43,0	42,0	46,6	46,0	38,5	41,0	40,0	40,0
Japan	48,5	47,8	47,9	43,9	44,6	42,4	50,8	47,1	48,4	50,5	48,2
Korea		31,5	32,3	33,1	33,3	33,4	34,0	26,6	20,9	29,0	23,0
Netherlands (5)	44,8			40,4	41,0	50,1	47,3	42,6	45,1	45,7	46,7
Portugal (3)	37,0	36,9	37,5	42,0	40,0	39,0	36,0	38,0	36,0	34,0	36,0
Spain	42,2	41,4	43,5	47,3	47,1	47,8	46,5	43,2	39,9	43,0	42,4
Sweden (4)(6)	37,3	36,3					44,0	46,0	47,1	42,3	50,4
Switzerland	46,0	42,0	44,0	50,0	50,0	46,6	39,0	38,0		41,2	41,5
Taiwan										22,8	35,8
USA	50,0	48,8	55,0	49,0	49,7	49,4	47,4	46,7	46,6	46,6	48,2
ISTMA average	44,6	43,8	45,9	46,5	46,2	47,4	46,3	44,8	43,6	42,7	43,8

Source: ISTMA
(1) The value for France, includes moulds and stamping dies and special tooling:
- For 1990 it includes moulds=46% and stamping dies =47%, total average =46.5%
- For 1991 it includes moulds=48% and stamping dies =51.7%, total average =49.9%
- For 1992 it includes moulds=46.5% and stamping dies =46.5%, total average =46.5%
- For 1993 it includes moulds=47.1% and stamping dies =44.1%, total average= 45.6%
- For 1994 it includes moulds=43.7% and stamping dies =45%, total average =44.35%
(2) West Germany, 1988, 1989, 1990
(3) Only moulds, for Portugal for 1988 to 1998 and for 1988 and 1989 for France
(4) The value for 1989 for Sweden includes owned shops
(5) For 1992 for Netherlands an estimated value
(6) For 1997 for Sweden only two firms have participated
Note: it may happen that the findings after 1994 for France only include moulds as they have similar trend in previous period, however nothing is said

From 1997 to 1998 (Figure 2G5c) Taiwan accounted for the highest increasing on employees' total costs. In opposition, Korea showed the highest reduction. This decline reflects the organisations policy in reducing their employees at the same time that firms opt for outsourcing services, with inherent increased organisation flexibility. Additionally employees are more qualified and therefore they are asked to perform diverse tasks. Portugal for the period spend more than 30% of their turnover on employees' total costs, yet this value is still far from the ISTMA average, that spends more than 40% of their turnover on employees costs.

Figure 2G5c - Employees total cost as % of turnover, 1994-1998



Source: ISTMA
(1) The value for France for 1994 includes moulds=43.7% and stamping dies =45%, total average =44.35%
(3) Only moulds
(6) For 1997 for Sweden only two firms have participated

Effective wages per hour (of skilled mould or toolmaker and skilled tool designer)

There was a slightly increase of the effective wages (the analysis is based on the skilled tool designers). In opposition, Portugal, on average, gradually increased the employees' wages (see Table 2G5d). However, the Portuguese wages still accounted for values far below the ISTMA

average, representing less than half of their value. An interesting fact is that skilled tool designers have higher wages than skilled mould or toolmakers, (see Table 2G5d), reflecting the extreme importance of the designers in the mould manufacture process as well as their inherent enormous responsibility. Both in 1988 and 1998 the USA was the country with the highest wages per hour, and Korea, Portugal with the lowest. Portugal shows that is able to maintain effective low wages, comparing with their competitors.

Table 2G5d - Effective wages per hour, average, 1988-1998, (Euros)

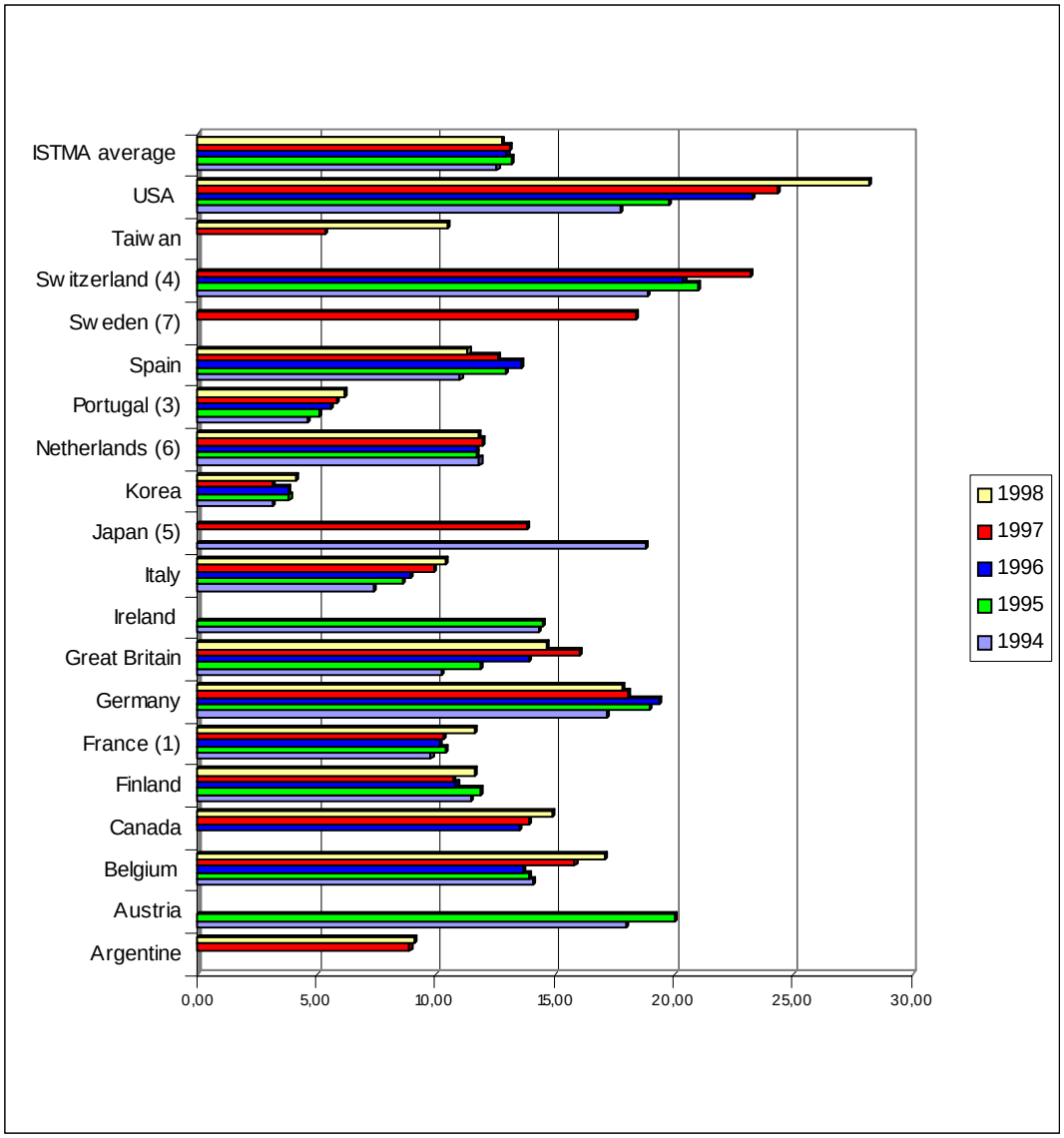
ISTMA Associated countries	1988		1989		1990		1991		1992		1993		1994		1995		1996		1997		1998	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Argentine																			6,30	8,89	6,55	9,09
Austria											11,43	14,75	11,83	17,94	15,58	20,03						
Belgium	8,71	11,34	9,68	11,71	9,92	13,09	10,66	12,86	11,66		12,34	14,20	12,39	14,06	12,50	13,92	11,93	13,69	11,62	15,81	11,58	17,08
Canada																	13,67	13,46	14,55	13,92	15,36	14,89
Denmark	13,59		14,80		15,19		12,80															
Finland	8,97	11,31	9,33	12,37	10,08	14,29	8,36	11,01	7,05	9,30	7,44	9,86	8,70	11,49	8,96	11,84	9,15	10,84	9,03	10,70	9,75	11,60
France (1)	7,25	8,06			7,88	9,02	8,47	9,33	9,18	10,19	9,39	10,11	9,22	9,79	10,06	10,40	9,47	10,13	9,54	10,29	9,41	11,60
Germany (2)	9,88	13,82	9,78	14,16	10,50	14,68	11,40	15,85	12,21	16,74	11,84	16,55	12,25	17,13	13,45	18,95	13,48	19,34	12,97	18,04	13,39	17,81
Great Britain	9,89	12,91	8,44	10,08	8,47	10,86	9,75	11,47	9,18	12,06	9,18	9,98	8,95	10,23	9,72	11,87	12,74	13,90	13,93	16,03	13,22	14,61
Ireland							9,77	9,15	8,94	11,67	9,03	14,70	10,29	14,29	10,27	14,49						
Italy			7,09	7,65	7,83	9,95	8,52	10,72	7,57	9,24	7,30	8,30	6,71	7,39	7,64	8,63	8,11	8,90	9,54	9,89	9,60	10,38
Japan (5)		10,10		10,10										18,80						13,80		
Korea	2,12	2,17	2,35	2,06	3,17	2,80	3,42	3,05	4,55	3,53	4,45	3,47	3,43	3,13	4,17	3,84	4,04	3,82	2,97	3,14	4,09	4,10
Netherlands (6)	6,53	7,40	8,48	9,26	8,75	9,71	9,40	10,27	10,04	10,97	10,36	11,32	10,82	11,82	10,69	11,67	10,69	11,68	10,96	11,97	10,66	11,78
Portugal (3)	3,51	3,77	2,97	3,32	3,30	3,69	3,82	4,28	3,82	4,28	3,70	4,13	4,02	4,64	4,44	5,07	4,77	5,58	4,96	5,80	5,29	6,14
Spain	7,84	9,93	8,21	10,30	9,74	13,31	10,80	14,42	9,18	12,39	8,76	10,97	9,00	11,01	9,89	12,91	9,41	13,55	9,77	12,57	9,07	11,33
Sweden (4) (7)	9,17	10,66					10,31		9,23		9,18		8,70		11,42		11,37		11,39	18,37		
Switzerland	14,85	16,75	13,81	14,92	14,86	16,57	14,48	17,16	16,06	17,78	17,65	20,73	16,28	18,88	18,44	20,98	17,89	20,38	18,90	23,18		
Taiwan																			5,06	5,33	9,82	10,51
USA	13,25	11,98	12,20	11,48	16,99	17,27	16,62	16,45	17,87	17,63	19,51	19,01	17,75	17,70	19,71	19,77	21,84	23,29	23,52	24,33	25,75	28,17
ISTMA average	9,63	10,01	9,74	9,78	10,56	11,27	10,61	11,23	9,75	11,32	10,10	12,01	10,02	12,55	11,13	13,17	11,33	12,97	10,94	13,06	10,97	12,79

Source: ISTMA
A - Skilled mould or toolmaker; B - Skilled tool designer
Note: wage comparison per May 31of the following year
(1) The value for France includes the wages of toolmakers and designers for the mould and stamping dies industries respectively:
- For 1990 it includes tool makers =8.31+7.45=15.76 / 2=7.88 and designers 9.03+9=18.03/2=9.015;
- For 1991it includes tool makers= 8.56 + 8.37=16.93 / 2=8.465 and designers 9.41+9.24=18.65 /2=9.325
- For 1992 includes tool makers= 9.44 + 8.82=18.36 / 2=9.18 and designers 10.59+9.79=20.38 / 2=10.19
- For 1993 includes tool makers= 9.11+ 9.66=18.77 / 2=9.385 and designers 10.31+9.91=20.22 / 2=10.11
- For 1994 includes tool makers= 9.31+9.12=18.43 / 2=9.215 and designers 9.71+ 9.86=19.57 / 2=9.785
(2) West Germany, 1988, 1989, 1990
(3) Only moulds, for Portugal for 1988-1998 and for 1988 for France
(4) For 1988 for Switzerland on average, monthly wages divided by normal monthly work hours

(5) For 1989 and 1994, 1997 for Japan, the average annual wage of an employee between 30-31 years old with 8 years of work experience, including bonus per hour
(6) For 1995, 1996 for Netherlands an estimated value
(7) For 1995, 1996 for Sweden only average of all metal workers available and for 1997 for Sweden only 2 firms have participated
Note: it may happen that the findings after 1994 for France only include moulds as they have similar trend in previous period, however nothing is said

Figure 2G5d shows that from 1997 to 1998 Taiwan accounted for the highest growth of wages per hour, yet this value is still far below the ISTMA average. As Asian Tiger economy develops, better wages tend to be claimed. Is interesting also to note that, for 1994-1998, countries such as Taiwan, Portugal, and Korea, which were among those with lowest labour wages, increased their values. Concurrently, countries like Great Britain, or Germany that normally are known as practicing high labour wages decreased their values. In Europe, Portugal, as mentioned before, is the country with the lowest wages per hour, and is followed by Italy (see Figure 2G5d). Is suggested therefore, that the Italian mould makers' may also achieve price competitive advantages based on their low wages.

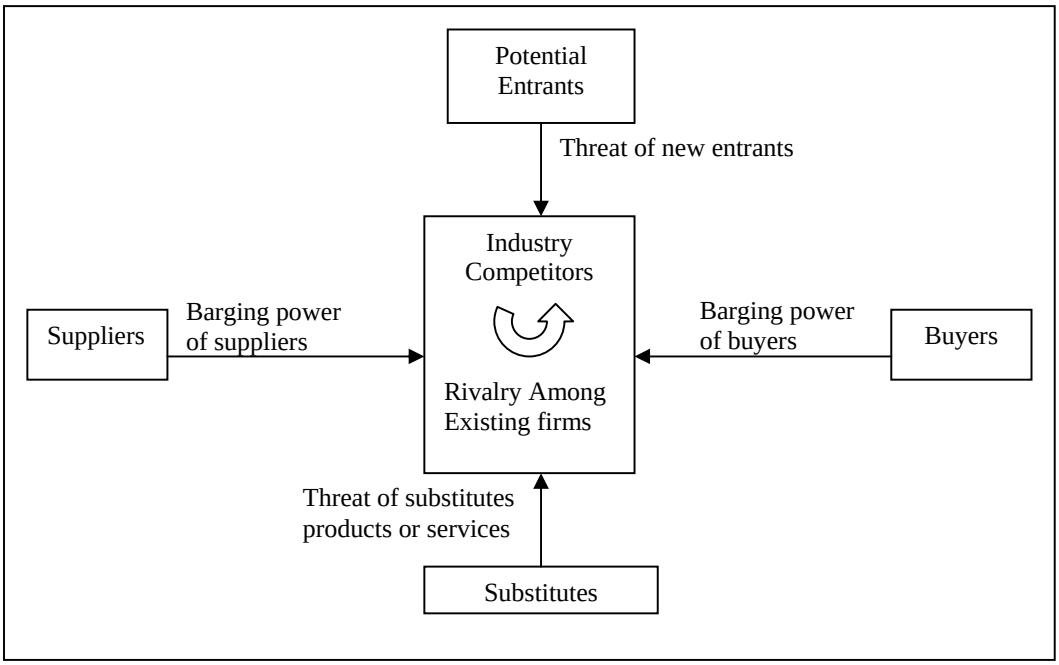
Figure 2G5d - Effective wages of skilled tool designers, per hour, average, 1994-1998, (Euros)



Source: ISTMA
Note: wage comparison per May 31of the following year
1) The value for France for 1994 includes the wages of toolmakers and designers for the mould and stamping dies industries respectively: tool maker= 9.31+9.12=18.43 / 2=9.215 and designers 9.71+ 9.86=19.57 / 2=9.785
(3) Only moulds
(5) For 1994, 1997 for Japan, the average annual wage of an employee between 30-31 years old with 8 years of work experience, including bonus per hour
(6) For 1995, 1996 for Netherlands an estimated value
(7) For 1995, 1996 for Sweden only average of all metal workers available and for 1997 for Sweden only 2 firms have participated

Appendix 2H - Summary of the Portuguese macro environmental context, i.e. the economical, political, technological, sociological and ecological trends in the past, present and in the future, based on the Porter 5 forces.

Figure 2Ha - Porter 5 forces, for driving industry competition



Source: Porter (1980:4), Competitive Strategy, Techniques for Analysing Industries and Competitors

Appendix 2H1 - The Past, the 50s, 60s, 70s and 80s

The 50s, 60s, and the 70s

The exports continued to growth, as the worldwide demand was superior to its offer. Customers continue to be primary multinational firms, demanding higher levels of quality and shorten delivery times. Moulds have become of greater complexity, boosted by technological developments.

In the 50s, the equipment used was files, lathe, pantographs, and finally the milling. The equipment was manually build up, as a result of the type of moulds that were produced, i.e. for

toys and domestic utilities, which did not require much precision but that was fundamental the harmony of the whittle (see interview with Henrique Neto, in Silva, 1996). According to Henrique Neto the steel was carved, sculpted manually, as the equipment of the time only made straightforward cuts. During these early beginnings of the industry few knew about the steel reactions and its shaping. Moulds would break and warp and no one could understand why (Beltrão, 1985). Was the stubbornness, creativity, effort, dedication, the trial-and-error learning, and the good will of one group of people who sincerely believed in the possibilities of the plastic mould industry, that overcame the challenges and has built up the grounds for one of the most complex and successful industries in Portugal.

At the end of the 1960s, mechanic and hydraulic copiers, and millings become more versatile. The use of drilling and grinding allow greater precision. It is through these new equipments that were possible to start to mechanise to some extend the several specialised mould tasks. The cut of the equipment is more powerful and of greater capacity, allowing to shape larger moulds and to reduce the time of the tasks. The mould draw becomes an important tool of communication among all the manufacturing phases and was a crucial factor for the development of the manufacturing process; it had a determinant role in the harmonisation of the communication among all the phases of the manufacturing process (see Armindo de Pinho e Silva in *O Molde* Nº4, 1989).

In this period the mould manufacturing process had a significant labour component (see Américo Silva in *O Molde* Nº5, 1989). First because the leading firms were losing their best employees as a result of the industry growth, and that was affecting the quality of the moulds, which, was only, overcame with an extra intensive labour. Second because the equipment that managers could afford sometimes in second hand, (the equipment was too expensive, the interest rates too high, and was difficult for the new managers to have access to credit) had low quality, obliging to the use of intensive labour to assure the customer's quality requirements. Nonetheless, in the beginning of the 70s some firms were already producing technical moulds (see Armindo de Pinho e Silva in *O Molde* Nº4, 1989). It is also in the 70s that the first CNC machines appeared in the industry.

Most managers that established their own firms were specialised in different phases of the mould manufacturing process (see Armindo de Pinho e Silva in *O Molde* Nº4, 1989), and therefore, had little knowledge and awareness of organisational management as well as international business (including the domain of a foreign language). Soon, trading (intermediary) mould firms such as the "Tecmolde", and the "Iberomoldes" led respectively by Mr. Antonio Santos and Mr. Henrique Neto & Joaquim Menezes started to appear to fulfil this gap. They had an important role in the internationalisation of the industry, and consequently on its development. Most of mould-manufacturing firms were primary dependent on national or international trading (intermediary) mould firms to export.

The qualification of the workforce as mentioned in appendix 2B2 was very basic. However there was an effort in industry towards to improve this situation.

In order to contribute for the development of the industry, The CEFAMOL, the Portuguese association for the mould industry was established in 1969. CEFAMOL is a non-profit organisation. Its role is to represent the industry in the relationships with the government, and other institutions, as well as to develop technological research, training, and the interchange of technical and scientific information between the association and other mould institutions, whether in Portugal or overseas. The association deals not only with the sub sector of the moulds for plastics, but also with other sub sectors of the mould industry. The Portuguese association for the mould industry has contributed significantly for the development and the growth of the industry, namely:

(a) as a mean of information and communication between the associated firms, spreading quickly and effectively information about new technologies and management innovation.

(b) in close collaboration with ICEP- Investments, Trade and Tourism of Portugal (equivalent to dti) encourages the growth of the Portuguese exports, through the organisation of trade missions[20], workshops, meetings, conferences[21], international conferences, participation at

[20] Such as to Japan, South Korea, Macao and Hong-Kong, France, Eastern Europe and Middle East, (see *O Molde* , Nº2, 1988, *O Molde* Nº5, 1989, CEFAMOL)

international exhibitions fairs[22], international advertisement of the Portuguese mould industry in diverse publications, (technical magazines or journals), and by publishing information about the industry. The CEFAMOL is also responsible for a trimester mould magazine: *O Molde*.

(c) by promoting the discussion of issues that are relevant for the industry and publishing the reflections and conclusions of those discussions (conferences proceedings), in order to register the evolutions and concerns of the sector[23].

(d) by being in the geneses and by being the main dynamic source for the establishment of the CENTIMFE (the Technological and Research and Development centre for the mould industry), in 1991.

(e) by being recently involved in the international promotion of the Portuguese mould industry image, i.e. *the made in Portugal*, through a advertisement campaigned that spread the quality and the technological capacity of the sector.

(f) by representing the Portuguese mould industry at the International Special Tooling and Machining association - ISTMA, publishing international statistics and other relevant information.

(g) by standardised and systematised a range of rules in the different functional areas of the firms. CEFAMOL has created the "a manual of procedures for the mould industry" this document has involved the participation of managers, technicians, and experts, aiming to be a fundamental guide for all that work in this industry.

(h) by giving to all its associated firms, juridical and economical advices.

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[21] According to Fernando Neto de Almeida (see *O Molde*, Nº7, p:48, 1990) the realisation of the I Congress of the mould industry, was a mark in the history, as by its influence happened an acceleration in the expansion and modernisation of the production process.

[22] Such as, *Plastics USA*, Chicago, USA, *Moldexport* in Detroit, USA, *K* in Düsseldorf, Germany, *Euromold* in Frankfurt, Germany, *Europlast* in Paris, France, *Mould'expo* in Paris, France, *Interplas* in Birmingham, UK, Brazilplast in São Paulo, Brazil, *Mercoplas* in Rio de Janeiro, Brazil, *Plastex* in Osaka, Japan, *Intermol* in Tokyo, Japan, *Chinaplas* in Pequim, China, *Equiplas* in Barcelona, Spain, *Expomoldes* in Zaragoza, Spain (see *O Molde* Nº6, 1989, *O Molde* Nº14, 1991, O *Molde* Nº20, 1993, O *Molde* Nº29/30, 1996, *O Molde* Nº31, 1997, *O Molde* Nº39, 1999, O *Molde* Nº40, 1999). Since 1993 there is in Leiria, Portugal the *Moldoplas* - international exhibition of moulds and plastics). See also Table 2H1a- the International exhibitions fairs plan for 2001 and 2002

[23] Yves Walter of EAMO, France said by the first International conference of the mould industry that, "I come to this event to exchange experiences, once in France in this sector we do not have this kind of events", see http://www.centimfe.com/archive/mp98/mp98.html

(i) by creating specific programs to support the development and modernization of the industry, i.e. the DIMOLDES project. This project aims: to improve the organisational management of the firms, to improve the technical competences of the employees, to spread and get known to the world the quality image of the industry, to train the workforce, to promote the debate of key issues for the industry, to research new technologies and techniques, to support financial information, and to support the exports. Currently, CEFAMOL accounts for 120 associated firms, being manufactures, traders and specialised in services, representing about 90% of the productive sector.

The ICEP is the official organisation for the promotion of the Portuguese economy around the world in the sectors of investment, trade and tourism of Portugal. Its main objective abroad is to promote Portugal as an attractive location for foreign investments and tourism as a producer of high quality products. ICEP collects, prepares and circulates information, implements activities of awareness and advice, manages means of incentive and develops promotion activities, to respond efficiently to the needs of the various recipients of its services. One of the most important tasks of ICEP is that of assisting Portuguese companies in defining and implementing strategies for a presence in foreign market, providing support in: a) defining analysing and implementing corporate projects aiming at a strategic approach to foreign markets and the internationalisation of Portuguese companies (market selection, identification of counterparts, adjustment of products to markets, analysis of competition, regulatory information, and the definition and implementation of marketing strategies); b) search for partners and bringing life into projects of cooperation between Portuguese and foreign companies; c) technical and trade information on the procedures relating to international trade, the respective rules and agreements.

Table 2H1a - International exhibitions fairs plan for 2001 and 2001

2001		
Fairs	*Local*	*Data*
ARABPLAST	Dubai	14-17th January
BRASIPLAST	São Paulo, Brazil	5-10th March
PLASTICA	Greece	9-13th March
WESTERN PLASTICS EXPO	Anaheim, California, USA	20-22sd March
HUNGAROPLAST	Budapest	27-30th March
EUROPLAST 4th edition	Milan, Italy	29-31st March
MOULDMAKING TECHNOLOGY 2001	Illinois, USA	3-5th April
PLASTEX	Osaka, Japan	4-7th April
INTERMOL	Tokyo, Japan	11-14th April
DUBAI PLAST PRO 2001	Dubai	23-25th April
PLAST-EX	Toronto, Canada	30-3rd May
EXPOMOLDES	Zaragoza, Spain	5-7th June
PLASTEC EAST	New York, USA	5-7th June
AVIPLAS	Caracas, Argentine	13-16th June
CHINAPLAS	China	26-29th June
PLASTICOS DE LAS AMERICAS	Miami, Florida, USA	24-26th July
PLASTICS USA	Chicago, Illinois, USA	2-4th October
SAUDI PLAS	Riyadh, Saudi Arabia	14-18th October
K'01	Düsseldorf, Germany	25-1st November
PLASTICS FAIR EXPO	Atlanta, USA	13-15th November
EUROMOLD	Frankfurt, Germany	2-1st December
2002		
ANTEC 2002	San Francisco, USA	5-9th May
EUROPLAST	Paris, France	3-7th June
INTERPLAS	Birmingham, UK	30th Sepetmber-4th October

Source: CEFAMOL

The 80s

Competition intensifies, whether nationally or internationally. At the end of the decade, Hong Kong, and Taiwanese mould makers started to serve the same Portuguese mould industries e.g. toy, domestic utility industries, but cheaper. As competition increases, customers become more demanding, and consequently their bargain power increases. In response to competition and customers' demand, the Portuguese moulds have become progressively more complex and of larger dimensions, with higher demanding in precision and quality as moulds for toys become more elaborated and firms emphasise the production on technical moulds.

The technological investments aimed to meet customer's requirements of quality (greater precision on measurements, increased mould complexity as well as shorten the mould delivery time). The Portuguese mould makers are known as technological leaders, i.e. they invest in the most advanced technologies. In 1983, for the first time in Europe a Portuguese mould firm introduced the CAD/CAM systems. These systems contributed significantly to increase the mould quality. This was the beginning of a new and modern phase for Portuguese mould industry. At the end of the 80th decade the industry was going through transitory period, from intensive labour to intensive capital. However, this technological evolution leads to a new problem: the qualified human resources to attend to the new technological developments (Armindo de Pinho e Silva in *O Molde* Nº4, 1989).

In the 80s, the qualification of individuals increased, and most of the workforce had the glass industrial course. However, workforce with specific knowledge about the mould industry (whether technological, organisational management or international business, see Castro Leão, *O Molde* Nº4, 1989) was still lacking, and this was the managers general concern, being frequently outlined. As Lenine Jesus Andrade stated:[24] "one of the most important problems of this industry is the lack of training; schools to teach the art of crafting the steel and how to use the new technological developments. It is required technical and superior courses to fulfill this gap".

[24] in an interview to the newspaper *"Correio de Azeméis"*, Nº2777, June, 1981.

Viewpoint that was shared by Joaquim Domingos Matos and Vítor Hugo Brandão[25]: "It is need specialised schooling", and "it is crucial training to prepare people". The industry was growing, as well as the need for skilled workforce.

Training was essentially based on what other more experienced employees were teaching, i.e. empirical knowledge. It uses to take ten years to train an employee until he/she becomes qualify, (to be autonomous on the mould manufacturing phases, sections or tasks) due to the shortage of schools and courses for the mould industry, yet was difficult to maintain the most skilled employees. As the industry was booming the most qualified employees (i.e. generally from each area of the mould production process of other long established organisations), were also leaving the organisations to establish their own firms, or were invited to leave their organisations to go to others[26], seduced by better wages. When employees leave the organisation, a part of the organisation is taken with them. As suggested by Applegate, Cash and Mills (1988:129) "every time an employee goes to another company, a little bit of corporate history and experience walks out the door." Firms were forced to a continuous train of new appendices and to extra costs. Long established firms could not compete with other new firms' tempting wages because they continually had high training expenses, i.e. they were paying the employee basically for learning (see Fernando Pedro, II Congresso da Indústria de Moldes, 1985).

In order to respond to the market demand for skilled workforce, in 1985 was created the "CENFIM - Centro de Formação da Indústria Metalúrgica e Metalomecânica (the Professional Training Centre for Metallurgy and the Metal working Industry). This institution was created under an agreement with the Instituto do Emprego e Formação Profissional - the IEFP (The Institute for Employment and Training), and both the Northen and the Southern Associations of Metallurgical and Metalwork industries, which are now called the Association of Metallurgy, Metal Working and Associated Industries of Portugal - the AIMMAP, and the National Association of Metallurgical and Metal Working companies - the ANEMM. The aim of the

[25] in an interview to the newspaper "*Correio de Azeméis*" , Nº2777, June, 1981.
[26] Those newly established organisations found that as they were growing they were requiring more workers, and due to the general shortage of skilled employees in the market, they were seducing employees from other organisations.

CENFIM is to promote career guidance and improvement in the metallurgy and metal working industries, by providing training for all professional levels in the firms (the courses run are for all the hierarchy in the organisation, since managers to apprentices, covering different fields, from the administration, CAD/CAM use to the CNC programming). This centre is a vehicle to adequate the employee knowledge to the newly technology developments. The centre also may undertake activities related to technological research and the spread of scientific knowledge (see Directory 94/95 - ICEP). CENFIM promotes and supports short and medium and long-term training programmes for apprenticeships, for specialised people, and for unemployed looking for new jobs. There are two training centres, one in Marinha Grande and another in Oliveira de Azeméis. Each of these centres attempts to develop programmes, which suits and support the requirements of the mould industry local needs. Since 1985, more than 600 professional training courses have been ran for approximately 7000 participants involving over 600 firms (see the Directory 98/99 - ICEP, CEFAMOL). The courses include among other areas, management, quality, environment, industrial maintenance, industrial design and planning, advanced production technologies (e.g. CNC operation and programming; Computer Aided Manufacturing - CAM, Computer Aided Design - CAD, Computer Aided Engineering - CAE; programmed automation; process automation techniques, Computer Integrated Manufacturing - CIM, and information technology in the development of solutions).

Additionally, in 1989, the Superior School of Technology and Management of the Polytechnic Institute of Leiria started to run the course of Mechanic Engineering, with a specialisation for Moulds and Plastics[27]. Moreover, the Secondary school in Oliveira de Azeméis has two new modules entitled " Draw and project for moulds" and "computers" (see Armindo de Pinho e Silva in *O Molde* Nº4, 1989).

Other problem emphasised by the mould industry was the cost of the technology. If on one hand was essential to constantly update the technology, on other hand the technology was too expensive, and high interest rates and the lack of government financial support, was a natural

[27] The course start to run in 1989, see decree 433/89 of 4 June. The content of the course as well as its name changed later in 1992 and in 1995.

discouragement for firms remain competitive. Firms were force to undertake an extra financial effort, which in their opinion should be back up by the government[28].

In order to overcome competition and sustain competitiveness, firms (especially the oldest and the biggest ones in the market), started to be more commercial-marketing orientated. Instead of using trading firms as their business intermediary, they to looked for their own customers and do business directly. Doing business directly allowed them to increase their profit margins as well as to keep price competitive advantages. To achieve this, firms created commercial-marketing departments and emphasise promotion policy, (e.g. advertisements in specialized magazines, presentation of workshops/seminars/conferences, participation at international exhibition fairs, participation in trade missions, and send mailings).

In the 80s, first steps on organisation management were also endeavoured. To become more competitive, firms were forced to answer efficiently to market opportunities and therefore to develop updated information systems. The commercial-marketing department had update information about their customer's moulds, and their different phases of the manufacturing process. New control organisational systems were implemented in the production process to ensure the mould delivery time, to define the mould cost and consequently its price, and to quote the moulds with higher accuracy. Organisation procedures (communication, methods, and materials) were standardised.

Concluding, the economic boom in the 80s generated some problems:

(1) Increased internal competition.

(2) Wage speculation, as a result of the shortage of skilled employees. The sector was growing but the market was not preparing qualified workforce for the industry. The solution was to offer higher wages to ensure qualify employees.

[28] see Lenine de Jesus de Andrade, in an interview to the newspaper, *Correio de Azeméis*, Nº2777, June, 1981

(3) Lack of international business knowledge. Firms were established by groups of employees that come from different specialised tasks of the manufactured process and therefore they had little knowledge about international business, consequently most of them relied primary on trade (intermediary) firms to export.
(4) The new established firms had short financial means. As a result the technology used in the beginning was sometimes poor, being most of the times conventional and in second hand (less productive).

Appendix 2H2 - The Present, the 90s

In the 90s, as in the 80s, customers continue to be mainly multinational firms of the automobile, electrical/electronic, and domestic utilities among other industries, with an enormous bargain power. Among the most demanding customers can be distinguished: Hasbro, Josef Weber, Leopold Kostal, AB Constructions-Bakelit, Flymo, Electrolux, General Electric, Philips, Samsonite, VDO, Textron, Allibert and Hartman, Curver packaging, Thomson multimedia televisions, Strata Products, Braun, BMW, Mercedes Benz, Volvo, Opel (Woxell), Renault, Citroen, Peugeot, Ford, Saab, Mitsubishi, Denso Manufacturing, Plastic Omnium, Valeo and Lear, General Motors, Bosh, Siemens, Cannon, Nokia, Audi, and Hewlett Packard (see Mouldmakers to the world, Moldes Portugal, ICEP, 1998). These customers are very demanding whether in quality (as they sell globally and they need to produce a huge amount of plastics pieces) delivery time (as they want to put their products first in the market place than their competitors), or price (especially the automobile industry, where cutting costs is one of its priorities).

As suggested by Mr. Ernesto São Simão (see *O Molde*, Nº9, P: 48,1990), the industry changed since they established their unit in 1947. As he said “In the 90s, the demand for quality is higher, as it is the demand for shorter delivery times. Operators of specialised equipment have been switched for technician Engineers. Experience and ability were replaced by technical knowledge.

Competitiveness and productivity are key words. Many firms have now injection machines, to try out the moulds and to produce the plastic pieces, phases. The future is the optimization of the human and technical resources available in the mould production".

Customers have become much more demanding[29]; encouraged by WWW developments and competition growth. Customer satisfaction and customer care became a new management issue and particular attention is given to it. The commercial-marketing effort is not exclusive of the exploration of markets and customers opportunities, and to get the firm to be known around the world. It also involves the establishment of a close and continuous relationship with customers in an attempt to loyal their purchases. A happy customer is a customer that comes back and brings more customers. Regular communications (e.g. regular visits to customers) are very important in the establishment of customers' relationships.

The Portuguese mould firms have become more specialised. Some firms concentrated their production in one kind of moulds: large moulds, to serve mainly one kind of industry, e.g. the automobile industry (see Grupo Simoldes , *O Molde*, Nº29/30, 1996). Others are offering specialised services such as mould bases, milling electro erosion, engineering services, etc.
As it has happened in the 80s, the complexity degree of the manufactured moulds increased, as well as their dimension. The Portuguese manufacturing firms in order to differentiate themselves from competition started to produce moulds of high complexity and of larger capacity. The equipment required to produce moulds of larger capacity is very expensive, forming a barrier to entry to other firms. One single EDM machine, for example, could cost over 1 million pounds, and it is only one of the equipment required to the manufacture the mould. In order to produce complex moulds is needed know-how, expertise and a long experience of learning and try, as well as creativity. Is known that the Portuguese mould firms have those attributes, forming other barrier for firms to get into the industry.

Competition in the 90s, is stronger than ever, and becomes very difficult to be beaten.

[29] see Amadeu de Sousa, in *O Molde* Nº18, 1992

Technological developments such as the World Wide Web allow access to information and communication, wherever we are, 24 hours a day, at a "speed of a click" in an easy, quick, comfortable, and cheap way. In order to overcome competition, in the 1990s, some Portuguese mould firms augmented; enlarged their product, i.e. they offer a variety of services alongside the manufactured mould. Firms started to design the product, to develop a prototype[30], to design the mould, to manufacture the mould, to produce the plastic pieces and to assemble the plastic pieces, i.e. firms moved backwards and forwards on the manufactured process (see Grupo Simoldes, *O Molde*, Nº29/30, 1996). Firms are adding value to the manufactured mould, as well as to their customers, and therefore developing a differentiator factor from competition.

Organisations also work in a close relationship with their suppliers. The supplier relationship in the 90s was re-invented. The suppliers are asked to participate and be involved in the creation of the organisation added value. For instances, the steel suppliers are offering the product with standardised quality.

In the 90s, organisations were re-structured towards quality certification, i.e. organisation management and organisation structure changed towards the implementations of quality systems and the achievement of a quality certification (see Table 2H2a - Firms that in 98/99 achieved quality certification). Quality certification is important, especially for those firms that are looking for new customers, and use the award as a recognised and credible symbol of quality. However, it is also important to note that quality certification is a very expensive and bureaucratic process, and some firms do not see any added value to their organisations in terms of quality, as a result of the implementation of this process, i.e. they would not improve their mould, or organisation quality as result of being certified.

[30] The product prototyping saves time and money, it allows visualising the product, detecting mistakes and proceeding to necessary amendments, before the moulds starts to be crafted on the steel. The product prototyping saves time (time to market) and money.

Table 2H2a - Firms that in 98/99 achieved quality certification

Name of the firm	*Quality certification*
Anibal H. Abrantes	ISO 9002
AFA	ISO 9001
Alfamolde	ISO 9001
Celectro	ISO 9002
Edilásio Carreira da Silva, Lda.	ISO 9002
Ibel – Irmãos Bernardes, Lda.	ISO 9002
Inamol	ISO 9001
Inova	ISO 9001
Intermolde	ISO 9002
Ln Moldes	ISO 9002
Molde matos	ISO 9002
Moldit	ISO 9002
Moldoplástico	ISO 9001
Planimolde	ISO 9002
Portumolde	ISO 9002
Simoldes Aços	ISO 9001
Socem	ISO 9002
Somoltec	ISO 9002
Somoplaste	ISO 9002
Thyssen portugal	ISO 9001 and ISO 9002
TJ Moldes	ISO 9002

Source: Directory 98/99-ICEP, CEFAMOL

In the 90th decade, training continues to be strongly emphasised (see Andreas Terheggen, *O Molde* Nº28, 1996). As technology and management are changing quickly, knowledge is an imperative and important tool to sustain organisation's competitiveness. Firms are training their workforce, at the same time that universities and schools are placing in the market individuals highly qualified to cover the specific needs of the industry. Concurrently, in January 1991, was established the "Centro Tecnológico da Indústria de Moldes, Ferramentas Especiais e Plásticos" - the CENTIMFE[31]", the (Technological Centre for the Moulds, Special Tools and Plastics Industry). This centre aims to support the development of the Portuguese mould industry, special tooling and plastics industries, by: i) providing technical business support, ii) implementing R&D

projects, iii) improving organisation quality, (quality management, standardisation, metrology, and quality certification), iv) developing training programmes for technical workforce, and v) creating and distributing technical literature/information, i.e. it promotes technical training and distributes technical information towards business development (see Directory 94/95 - ICEP). The centre helps companies to exploit leading edge technologies such as high-speed machining and 5 axis-machining systems. It encompasses developing and implementing new methods and processes to improve quality standards, e.g. ISO9000 and calibration of tool making and quality control equipment. It pays special attention to the Computer Integrated Manufacturing - CIM. The centre is closely involved in mould making industry projects whether in Europe or internationally. It provides technical support, including: Injection moulding machines for mould testing; EDM counter sinking equipment; CNC wire-cutting equipment; A Mori Seiki turning centre, and Digitising equipment. The CENTIMFE plays a major role in the development 3-D modelling and rapid prototyping technology in the industry. Computer facilities keep firms ahead on mould design, using the latest software releases, including mould flow and Finite Element Analysis. Moreover, the centre gives the industry access to up to date 3-D co-ordinate measuring equipment, mechanical testing and metrology facilities.

Firms rather than inviting employees from other companies to work for them are recruiting employees from the above-mentioned institutions, and when they still cannot meet their needs they opt for contracting specialise training firms.

In the 90s, technological developments such as wire cutting, laser equipment, quality control equipment, CNC systems (to program and run the plant equipment), rapid prototyping, rapid tooling, simultaneous engineering and integrated software systems (to link up the entire organisation and supply accurate information about each mould and their phases on the manufacturing process) allowed increasing mould quality, shortening mould delivery time, as well as cutting costs, which are the most important requisites for demanding customers. Today the Portuguese mould firms are amongst the most innovative firms in the use of CAD/CAE/CAM

[31] According to Rober Neilley, of the *Injection Molding Magazine*, by the first International conference, 1997, "CENTIMFE is the biggest research centre of moulds in the world, and know all of them (see

and other technologies for the development of the mould project and the mould manufacture. Firms also invested in innovative and high precision tools, namely in the electro erosion and the technologies of finite elements analyses (FEA).

Most firms are linked to the World Wide Wed, increasing their opportunities to be known to potential customers (see Table 2H2b).

Table 2H2b - Firms that have e-mail, 98/99

Name of the firm	***e-mail***
A Rigorosa	arigorosa @mail.telepac.pt
Anibal H. Abrantes	abrantes@iberomoldes.pt
AFA	afa@netlandia.pt
Alfamolde	alfamolde@mail.telepac.pt
Ampco	ampco@ampcometal.pt
Azemoldes	azemoldes@mail.telepac.pt
Celmex	celmex@mail.telepac.pt
Cemo	cemo@ip.pt
Costa & Rocha	crmoldes@mail.telepac.pt
Duramoldes	np94di@mail.telepac.pt
Edilásio Carreira da Silva, Lda.	edilasio@iberomoldes.pt
Ernesto São Simão	molds@ess.pt
Europlaste	europlaste@mail.telepac.pt
Famolde	famolde@mail.telepac.pt
Famplac	famplac@ip.pt
FR CAD	frcad@mail.telepac.pt
Geco	geco@mail.telepac.pt
ITM	itmlda@mail.telepac.pt
Ibel – Irmãos Bernardes, Lda.	lebinter@mail.telepac.pt
Iberomoldes	adm@iberomoldes.pt
Ideal Molde	idealmolde@mail.telepac.pt
IMA	ima@telepac.pt
Implastic	imoplastic@imoplastic.pt
Inamol	inamol@mail.telepac.pt
Inova	inovamg@mail.telepac.pt
Intermolde	intermolde@intermolde.pt
JDD	jddmoldes@mail.telepac.pt
Ln Moldes	lnmoldes@mail.telepac.pt
Lismolde	dep-tec@lismolde.pt

http://www.centimfe.com/archive/mp98/mp98.hml).

MDA	mda@mail.telepac.pt
Manuel E. Miranda	memir@mail.telepac.pt
Marimoldes	marimoldes@netlandia.pt
Mecamolde	mecamolde@mail.telepac.pt
MGM	mgm.lda@mail.telepac.pt
Molde matos	mmatos@moldematos.pt
Moldegama	moldegama@netlandia.pt
Moldene	moldene@mail.telepac.pt
Moldes Catarino	moldes.catarino@mail.telepac.pt
Moldes Lecomema	moldes.lecomema@mail.telepac.pt
Moldit, SA	moldite.sa@mail.telepac.pt
Moldoeste	moldoeste@mail.telepac.pt
Moldoplástico	modolplastico@mail.telepac.pt
Novateca	macad@mail.ip.pt
Olesa	olesa@mail.telepac.pt
On-Time Molde, Lda	ontime.mi@ip.pt
Planimolde	planimolde@mail.telepac.pt
Portumolde	portumolde@iberomoldes.pt
Ramada	ram.informatica@mail.telepac.pt
Rerom	rerom@mail.telepac.pt
Riamolde	riamolde.tec@mail.telepac.pt
Ribermolde	ribermoldelda@mail.telepac.pt
Rosagui	rosagui@mail.telepac.pt
SETSA	setcom@mail.set.pt
Simoldes Aços	simoldes@mail.telepac.pt
Soarmoldes	soarmoldes@mail.telepac.pt
Socem	socem@mail.telepac.pt
Somema	somema@mail.telepac.pt
Somolin	somolin@mail.telepac.pt
Somoplaste	somoplaste@mail.telepac.pt
Sorep	f.ruivo@mail.telepac.pt
SPEM	spem@mail.telepac.pt
Tecmolde	tecmolde@mail.telepac.pt
Tecnimolpás	tecnimoplas@netlandia.pt
Tecnisata	tecnisata@mail.telepac.pt
TJ Moldes	tjmoldes@comnet.pt
Transmolde	transmolde@mail.telepac.pt
UPM	upm@upm.pt
Unitecmol	dep.tec@lismolde.pt

Source: Directory 98/99-ICEP, CEFAMOL

During the 90th decade ecological concerns increased. Ecological concerns related to the plastic recycle, may erase the plastics costs advantages and other substitute materials may be preferable. The major plastic industry concern will be plastic recycle. Environmental groups are pressuring governments to produce legislation in order to protect the environment. For example, PVC has been under fire from environmental groups who are demanding legislation to ban it. Attitudes toward recycling are different around the world. In Europe, especially in Germany, legislation is very strict. The Government levies a charge on every packaged good sold and collects a fee from the producers for recycling purposes. However recycling programmes often fail due to the lack of public participation and limited market opportunities for reclaimed products. Nonetheless, there is a danger that enforced plastic recycling could erode cost performance (Rodrigues, 1997), which, would affect the plastic mould industry.

Appendix 2H3 - The future, the new millennium

The mould industry will continue to growth[32]. However, the slowdown of the American economy, in the second semester of 2001, set back the world economy (when America sneezes the rest of the world gets a could). The statistics indicate that the US is currently economic recovering with positive impact to the Portuguese mould makers.

China and India economies will continue to growth, being simultaneously a threat and a market opportunity for the Portuguese mould industry.

[32] For example in the automobile industry, plastics are lighter than other materials and further contribute to enhanced fuel economy. Plastics are also being used for their corrosion and chemical resistance, sound and vibration insulation, pampering isolation, high strength to weight ratio, design flexibility and lower finishing costs than other materials. Plastic is also employed in exterior uses such as body panels, bumpers, intrusion beams, anti-skid braking and laminated glass. There has been also a significant hastening in the use of plastics under-the-hood, particularly in engine and mechanical applications, as heat resistant resins flatter costs performance for parts such as air intake manifolds, oil pans, batteries, fuel tanks, rocker box covers, valve covers and fuel rails. The consumption of plastic materials for automobile applications is likely to increase globally at a rate of 3-4% per year in the next 2 years.

The world population pyramid is inverting in the developed countries, i.e. we have more elderly people. Therefore, there is an opportunity for the development of new products and services to serve this market segment.

There is also a possibility for the appearance of new composites; recycle materials that imply the production of other kind of moulds.

Customers will demand for attractive, interactive, multifunctional, of high quality and of reasonable price products. It is also the Portuguese mould industry responsibility to contribute for the creation of these products. Customer satisfaction and care will be intensified. Firms need to show to their customers that they are committed in solve their problems.

Suppliers will continue to be asked to be involved in the customers' added value creation. Related to the PMMF technological suppliers a close relationship should be established in order to achieve an integrated training policy, that, helps the PMMF to take the best possible advantage of the technology, and the PMMF' technological suppliers to understand the real needs of firms in their manufacturing process.

Specialisation will be the key word to achieve competitiveness. Firms should produce not what they can do well, but what they can do better than others. Firms need to trade off from the market segments which they cannot achieve competitive advantages; otherwise there will be a waste of resources. Firms that cannot achieve cost differentiation advantage should avoid price-sensitive customers. Firms that will be in all the battles will be not able to win any. If we are not competitive in a market segment we should withdraw from it and specialise in what we are better than others. The Portuguese mould industry should concentrate their production in moulds of high-added value, in which customers satisfactorily perceive the quality/price binomial. It should be emphasise quality, and creativity in the product creation, whether through the use of new technologies (e.g. Computer Integrated Manufacturing - CIM, or Computer aided planning - CAP.), or through the use of new techniques (design).

The challenge of the millennium will be knowledge. Our competitive advantage will be creating added value for customers with the available resources. More than having the technology, it is necessary to use it in different ways. The big challenge will be *from the old make new*. We need to do something different from competitors, and quicker. Something that is difficult to copy, something that is difficult to measure, i.e. organisational knowledge. Key to strategic advantage is the interaction among knowledge, organisation and customer. Knowledge is the new venture of the new century.

Firms should continue to emphasise training. Knowledge does not take space but takes places, and other firms may take the Portuguese mould firms place.

The Portuguese mould industry institutions (e.g. CEFAMOL, ICEP, CEMFIM; and CENTIMFE) should continue to support the industry development, namely through market research studies (about customers, competitors, and suppliers), as they are very important tools for mangers in their process of decision-making, and through new technologies that allows competitiveness edge. The ICEP should continue to be a vehicle of promotion of the industry image overseas.

- The Web as a source of information, and entertainment, now being accessible not only by computer but the wireless technologies (e.g. mobile phones),
- The web for continued work development; with non-stop, as the work can be shared, (when one corner of the world is slipping the other is waking up to continue the work),
- The development of integrated technologies (access to suppliers systems, access of customers to their products and manufactured phases at mould makers plants, and management integrated systems that controls raw materials, the manufacturing process and its quality control, debiting the information in the organisation accounting system).
- The use of the TV communications to receive and conduct information.
- The electronic plastic cards as guardians of individual information, such as medical, taxes or criminal records.
- Virtual reality

will increase competition among suppliers, competitors and firms. These technological developments will allow worldwide information and communication, shortening delivery times as well as reducing the margin of conception error.

In the new millennium, ecological concerns will increase. People will be more sensitive to the ecological problems and they will act accordingly to protect and avoid the destruction of the planet: *Be Green.* The global temperature of the planet is increasing, with consequences in the global weather change. Climacteric transformations will have relevant consequences in populations health, agriculture etc. New products for water conservation will be developed. Water will be an essential good that would be rare. The development of new models of energy, technologies and products that not damage the environment will be emphasised, such as ecological cars, friendly environmental fridges, less polluted products, etc
The environment concern may put back or limited the use of plastics or may also encourage or force the use of recycled thermoplastics.

The future of the Portuguese mould industry is ensured by its technological development by its manufacturing process, by its continued investments in equipment and training policies as well as production flexibility and adaptability to the changeable environment. The success behind the Portuguese mould industry is based on determination, dedication, commitment of the workforce, their learning process, experience, capacity of analysis, high specialisation on the manufacturing mould phases or tasks, and technology expertise. As stated by Aníbal H. Abrantes (1981)[33] "we are among the best in the world. We are not afraid of the future; we just need to continue to produce moulds with quality and to respect the delivery time. We have a workforce with high creativity and responsibility which in highly precision industry is essential".

Concluding, the future of the industry should be synonymous with:

- Knowledge emphasis: incentives to team projects creativity development
- Specialisation
- Research and Development

[33] in an interview to the newspaper, *Correio de Azeméis*, Nº2777, June, 1981.

- The creation of added value for customers, innovation, differentiation
- Customer satisfaction, customer care and customer trust towards customer loyal purchases
- The establishment of close relationships with all that interact with the organisation and contribute for the creation of the added value, i.e. customers, collaborators and suppliers.
- Continued investments in the most advanced technologies
- Automation of the control systems, in order to dilute bureaucracy
- Good communications systems
- Knowledge emphasis: continued emphasises on training

Appendix 2I - Some of the comments made by the Portuguese mould makers' customers*:*

" Famolde" has been among our best suppliers in terms of people, equipment, quality and service. The moulds they have provided are our most complex and were built to very exact specifications"

Stefan Nix
of Josef Weber GMBH & Co, Dillenburg, Germany,
Manufacturers of technical components
for the automotive, electronic and aerospace industries
in the Mouldmakers to the world, Moldes Portugal, ICEP, 1998.

Famolde is specialised in the production of small high precision injection moulds.

"*SET", helped us to cut PCP (Product Creation Process) times by 50%. Their project involvement included design support, which enable them to work in parallel with our team. This is the type of performance we expected from a world supplier*".

Hank de Vries,
Quality support managers for Philips
domestic appliance division
in the Mouldmakers to the world, Moldes Portugal, ICEP, 1998

SET, the high-tech organisation set up to spearhead simultaneous engineering project support customers. SET's design and prototyping work encompasses all aspects of product development, from initial concepts to design for production and assembly. This service helps customers to cut the time required to bring products onto the market.

SET belongs to the Iberomoldes group, which the main aim is to invest in people and as a result established a centre, i.e. the Iberomoldes ACE, Professional training, which has as purpose to professional training staff.

We have been a "Moldoplástico" customer for a number of years. For the large moulds that we require, they offer a very good combination of quality and price"

Andre Van Oostenbrügge,
project manager/mould engineer, Hartman Groep BV,
one of Europe's leading suppliers of garden furniture and waste containers
in the Mouldmakers to the world, Moldes Portugal, ICEP, 1998.

Moldoplástico is producing large and complex moulds for long production runs. Commercial relationships are the key to the company's success in the international market. By understanding the particular technical requirements and the market pressures that customers face, the company can offer more competitive pricing and ensure that the moulds are supplied right on time.

Our co-operation with "Planimold", a high grade quality company, and our experience of working with them is extremely positive"

Dynoplast Stjordal,
Stjorday, Norway,
the Scandinavia's largest plastics manufacturers,
supplying the automotive, electronics, and food industries
in the Mouldmakers to the world, Moldes Portugal, ICEP, 1998.

They were the first in Portugal to achieve the ISO9002. Planimole's focus on quality has been recognised, particularly in Europe, where ISO9000 certified is today most keenly sought.

We tried to source from local toolmakers but they could not come close to "Simoldes" in terms of delivery times. Simolde's speed of response to a number of very sudden design changes by automotive companies has also been incredible

Martin Burnell,
moulding engineer, production engineering department,
Denso Manufacturing, in the UK,
World leading OEM supplier of heating and ventilating systems to the automotive industry
in the Mouldmakers to the world, Moldes Portugal, ICEP, 1998.

The Japan is impressed with the quality of the manufactured moulds

Martin Burnell
http://www.centimfe.com/archive/mp98/mp98.html

Simolde's strengths are the ability to be flexible at every organisation level from the boardroom to shop floor and its ability to service both upstream and downstream of the product development chain. Simoldes operates within simultaneous engineering projects, which involves it in projects up to years before cutting steel. Cost reduction is another key issue for automotive customers. Wage and infrastructure cost advantages in Portugal, give Simoldes an extra competitive edge

over its European competitors. This position is likely to strengthen due to productivity gains now emerging from investment in new technology and in people. Simoldes's people development policies are geared to develop skills, which combine a flair for improvisation and innovation with the ability to work within tight management regimes.

"Tecmolde" score highly on service, excellent tool quality, reliable delivery times, communications, CAD systems and competitive prices for tools.

Sven Barnet,
purchaser, Nokia.
in the Mouldmakers to the world, Moldes Portugal, ICEP, 1998.

The company focuses on maintaining strong communications at all projects stages, which it believes is the key to minimising delivery times. They operate rapid prototyping equipment, which can turn out functional plastics models in less than 24 hours, enabling customers to visualise their product concepts.

"TJ moldes" has been a supplier to us over 4 years for parts such grill and consoles: they are very good on quality, price, delivery and reliability

Reinhold Jörg,
Industrial Engineering at world automotive components supplier, Magna
in the Mouldmakers to the world, Moldes Portugal, ICEP, 1998.

TJ moldes has worked with leading universities and research centres throughout Europe, to maximise its capabilities and to serve the most demanding European and US markets. The company's active role in joint European Community working groups, under ESPRIT; BRITE; COMET and CRAFT projects, have given it a key position to customers. Participation in European research has enabled the company to develop new production systems and materials, which are used in reducing delivery times, increasing quality and competitive pricing. The company involvement in BRITE project on the development of laser sintering allows has lead to major savings in the cost of machining and processing steel during the production of injection moulds. Involvement with another consortium on Computer Integrated Management is helping to optimise the way organisation; its people and computer-based technologies combine to meet

customers needs. With its continuing technology links with leading European industry research centres and universities, TJ moldes has leading technical edge in the mould making industry.

The Portuguese mould firms are excellent in interpret the customer's needs, they are very versatile, technological evolved and offer a excellent quality, price relationship.

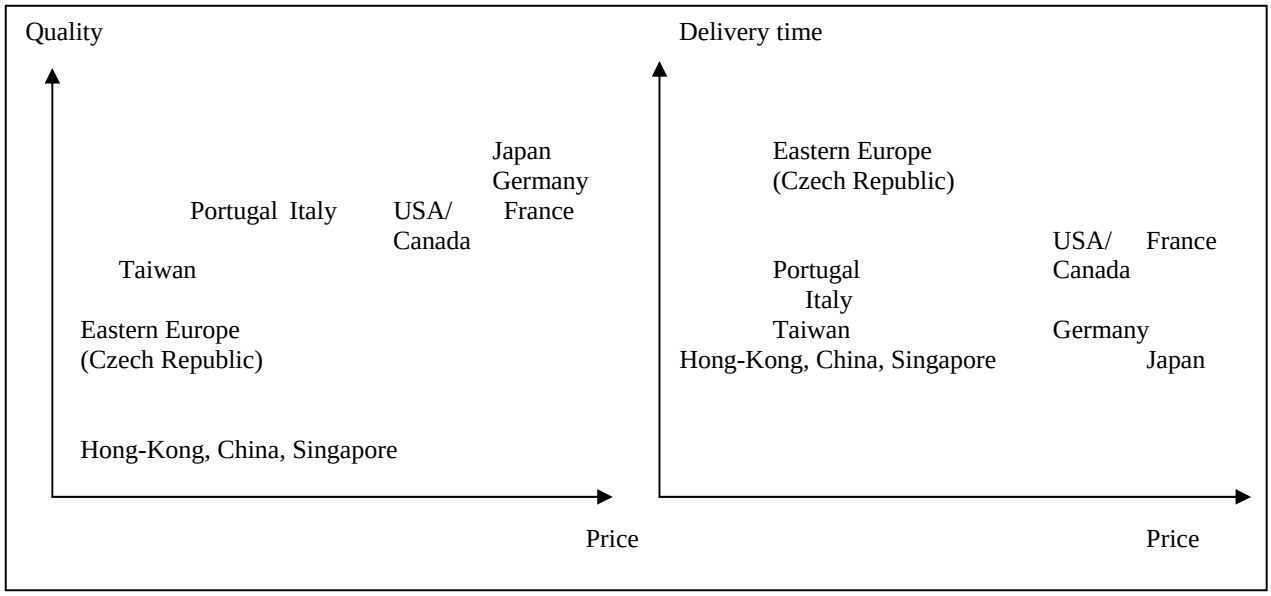
Paul Carter,
Phillips, in the IK
http://www.centimfe.com/archive/mp98/mp98.html

Appendix 2J - Competition

The key competitive factors on which firms are competing

According to the Portuguese mould makers, there are three major key strategic factors on which mould makers compete: delivery time, price and quality. However, the later could be less questioned as firms (especially multinational firms) clearly define the quality prerequisites needed to be qualified to sell the mould. For example, Hewlett Packard defines a number of firms as capable to produce quality moulds, e.g. 30 firms. So, if all them are able to offer the same levels of quality, quality is not an issue, and delivery time and price, became the central topic of their decision-making process. In order to understand the different positions of competition to the three key competitive factors, Figure 2J1 was developed. The Figure illustrates that moulds from Hong-Kong, China or Singapore are very competitive on delivery time and price, however they have lower levels of quality. Japanese mould makers are very competitive on delivery time and quality, but their moulds are more high-priced. The Portuguese and Italian mould makers are competing on the same base, with a slightly advantage of the Portuguese on price and on the Italian on delivery time.

Figure 2J1 - The key competitive factors on which firms are competing



Asia Competition

As some of the Portuguese mould makers have identified the Tiger Asian mould makers as their competitors, the current research contacted the Federation of Hong-Kong Industries and asked them about the Hong Kong's Mould Making Industry. All the information that follows is based on their point of view and reports to the end of 1997.

The strength of Hong Kong mould makers lies in its ability to produce moulds with short delivery time, which is essential for the manufacture of fast-moving products. Hong Kong is more competitive in the medium to low precision moulds, in markets such as the USA and Germany where labour wages are high. The Hong Kong's mould-making industry continues to develop towards high quality precision. Electric discharge machine (EDM) are now widely used. The latest technique of quick tooling is being adopted to reduce the time needed for mould making.

Industry statistics

In September 1995 there were 1.989 establishments, which were employing 7.932 employees.

Product range

The plastic injection moulds account for the major share of the mould making industry's total production. They account for more than 65% of the industry's total production while metal dies constitute 20%, die-casting moulds about 10% and the remaining are forging dies and extrusion dies.

Most of the moulds are custom-made for the production of general consumer products. The end products of these moulds include:
-General consumer products: toys, household appliances, videocassettes, and telephones
-Large size items: furniture, television sets and casings for office equipment
-High Precision Components: optical components, precision gears

-Geometrical profile items: automobile lamps, helmets, turbines, fan blades

Export Performance

	Value: HK$ Mn. (% Change)			
	1995		1996	
Domestic Exports	1, 140	(-13%)	921	(-19%)
Re-exports	978	(+2%)	1,233	(+26%)
(of China)	156	(+6%)	252	(+62%)
Total exports	2,118	(-7%)	2,154	(+2%)
Total exports by major market in 1996	China (69%), USA (7%), Singapore (2%), Japan (2%)			

Industry features

A number of Hong Kong light industries including toys, plastics and consumer electronics, provide an extensive markets for plastic mould. More than 65% of Hong Kong's mould manufacturers are small firms employing less than 10 workers. The strength of local mould making industry lies in plastic injection moulds. The absence of heavy industry rendered Hong Kong less specialised in large-size precision engineering injection moulds and precision metal dies, especially those using cemented carbines as tool. On the other hand, Taiwan and Korea have wider industrial bases for developments of large-size injection moulds, die-casting moulds and forging moulds.

The strength of Hong Kong lies in its ability to produce moulds with short delivery time, which is essential for the manufacture of fast-moving products. In comparison, the USA may need 120 days to produce a mould for general consumer goods. Germany takes about 200 days. Hong Kong requires only 90 days, second only to Japan in Asia.

Sales Channels

Since moulds are custom-made for the end products, mould makers usually deal with end users (manufacturers) directly, including overseas customers. However, for some low-end products, the

mould makers may rely on exporter for specifications. In general, before the mould is made, technical drawing showing details of the end product and machinery would be sent to the mould makers. To ensure accuracy, product/industrial designers would discuss the details of the mould with the mould makers. The cost for adjustments of finished moulds is very high.

Recent Developments

Total exports of moulds increased by 2% in 1996, while re-exports increased by 26%. China was the biggest market, taking up 69% of total exports. The increased outward processing activities in China have been the major driving force behind the growth of Hong Kong exports to China. Although China now promotes its mould making industry and discourages the imports of lower-end moulds, Hong Kong continues to process comparative advantage in the market for medium to high precision moulds in China.

Due to the growth of light industries in other Asian countries, exports of mould to these countries are rising. The quality of Hong Kong moulds has been highly regarded and is reported to be comparable to that of Japan. A large share of the mould making factories in Singapore is run by Hong Kong technicians.

Hong Kong is more competitive in the medium to low precision moulds for markets such as the US and Germany where labour wages are high. On the other hand, import of high precision moulds by these countries is rare, because their domestic mould makers can provide ready supply of quality moulds and frequent after-sale technical support.

While Hong Kong's mould making industry continues to develop towards high quality and precision, the mould manufacturers have yet to adopt more advanced technology. Electric discharge machines (EDM) are now widely used and high precision CNC (computerised numerical control) machines are also beginning to be used. The leading companies started upgrading from labour-intensive design and production of tooling to computer-aided design and

manufacture some years ago. The latest technique of quick tooling is also being adopted to reduce the time needed for mould making.

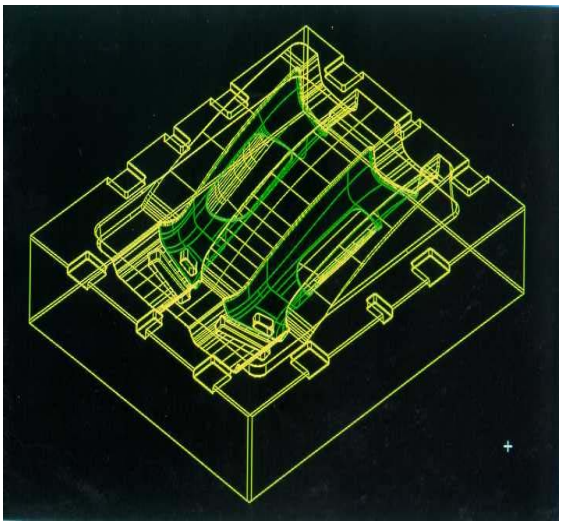
Hong Kong's mould making industry has also relocated to China to support Hong Kong manufacturers, which have set up plants across the border.

Figure 2D1 - The manufacturing mould process

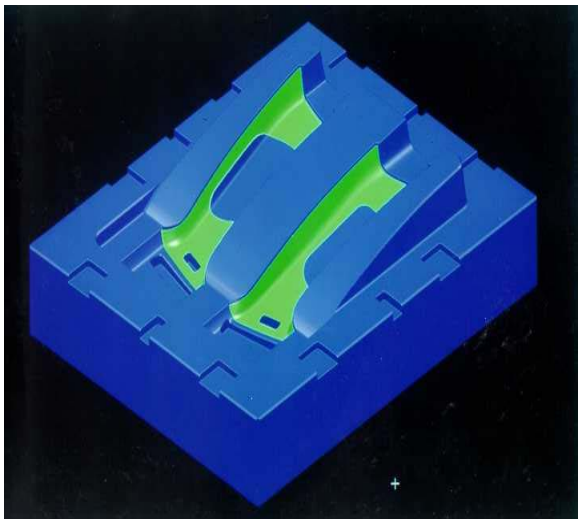
The mould project - product definition and mould design.

Source: Courtesy of Famold

Source: Courtesy of Famold



Source: Courtesy of Somema



Source: Courtesy of Somema

Machining

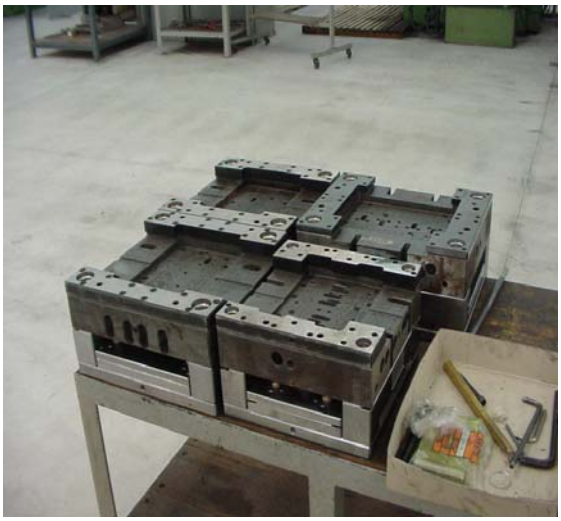
CNC

Source: Courtesy of Famolde

CNC Turning

Source: Courtesy of Famolde

Steel worked



Source: Courtesy of Famolde

Hot injection channels

Source: Courtesy of Somema

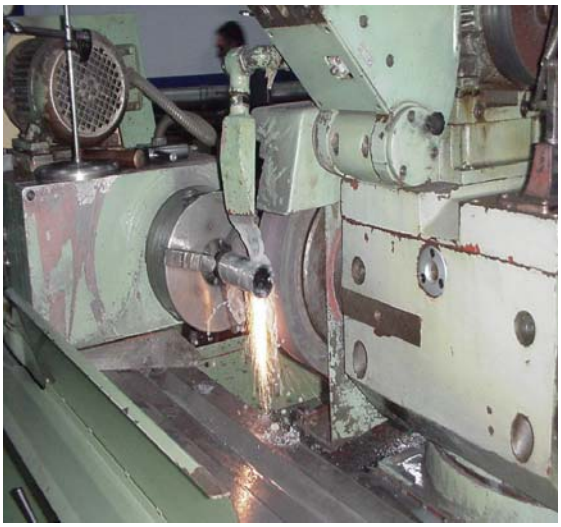
Driller

Source: Courtesy of Famolde

Grinder

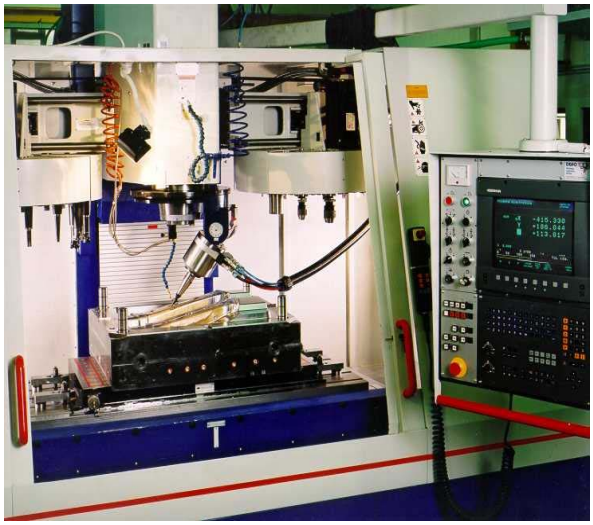
Source: Courtesy of Famolde

Cylindrical Grinder



Source: Courtesy of Famolde

CNC Milling



Source: Courtesy of Somema

CNC EDM - electro erosion

Source: Courtesy of Somema

CNC EDM - electro erosion

Source: Courtesy of Famolde

CNC Wire cutting

Source: Courtesy of Famolde

Quality control

Source: Courtesy of Somema

Quality control

Source: Courtesy of Famolde

Polishing

Source: Courtesy of Famolde

Finishing (Fitter - vertical press)

Source: Courtesy of Somema

Assembling

Source: Courtesy of Famolde

Mould try out

Source: Courtesy of Famolde

Mould ready to be deliver

Source: Courtesy of Somema

The product

Source: Courtesy of Somema

Appendix 3

The Conceptual Framework and the Research Hypotheses

Appendix 3A - Summary of the research process to explore Miles and Snow's (1978) strategy types

Figure 3A1 - Summary of the research process to explore Miles and Snow's (1978) strategy types

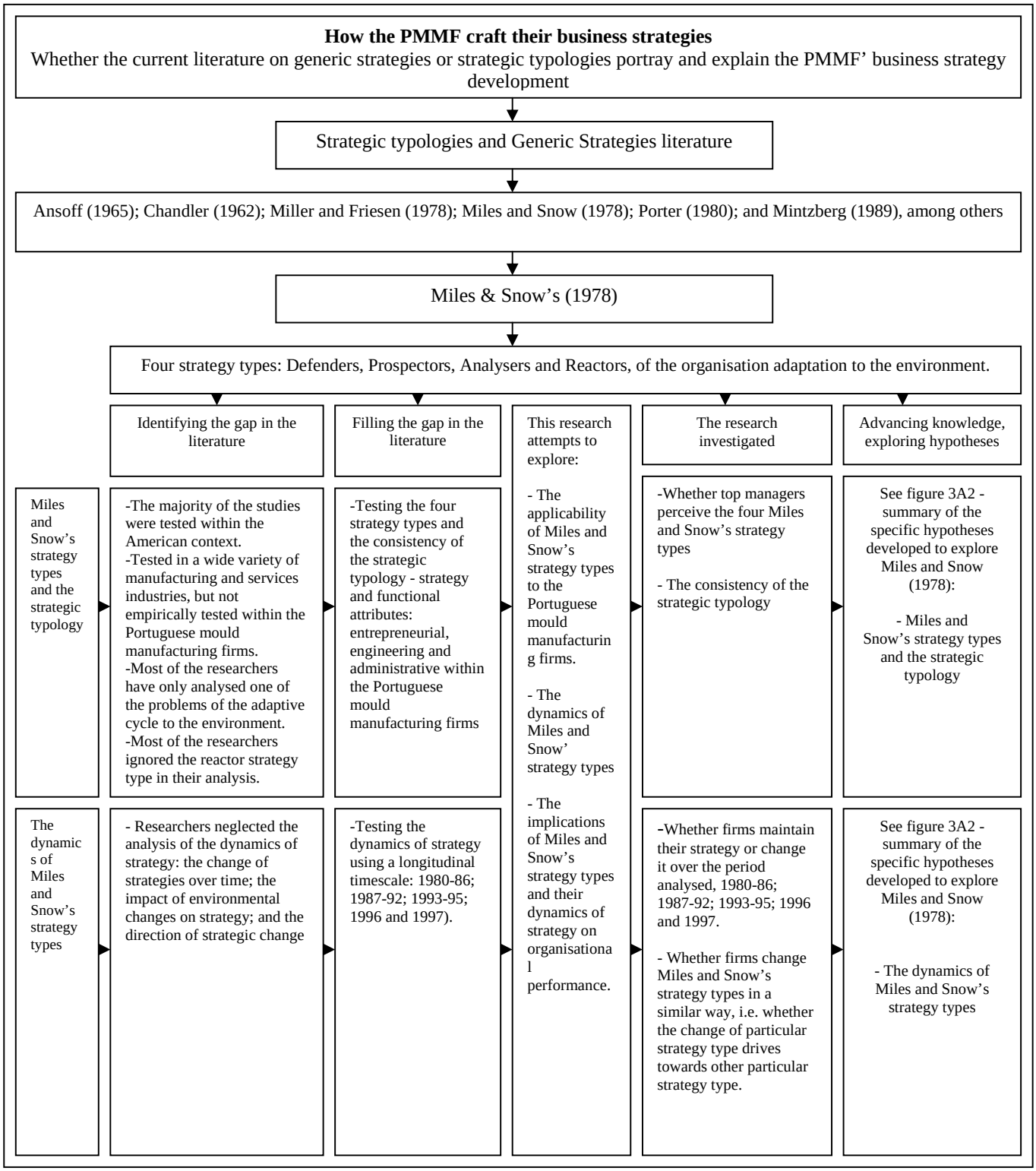


Figure 3A1 Cont. - Summary of the research process to explore Miles and Snow's (1978) strategy types

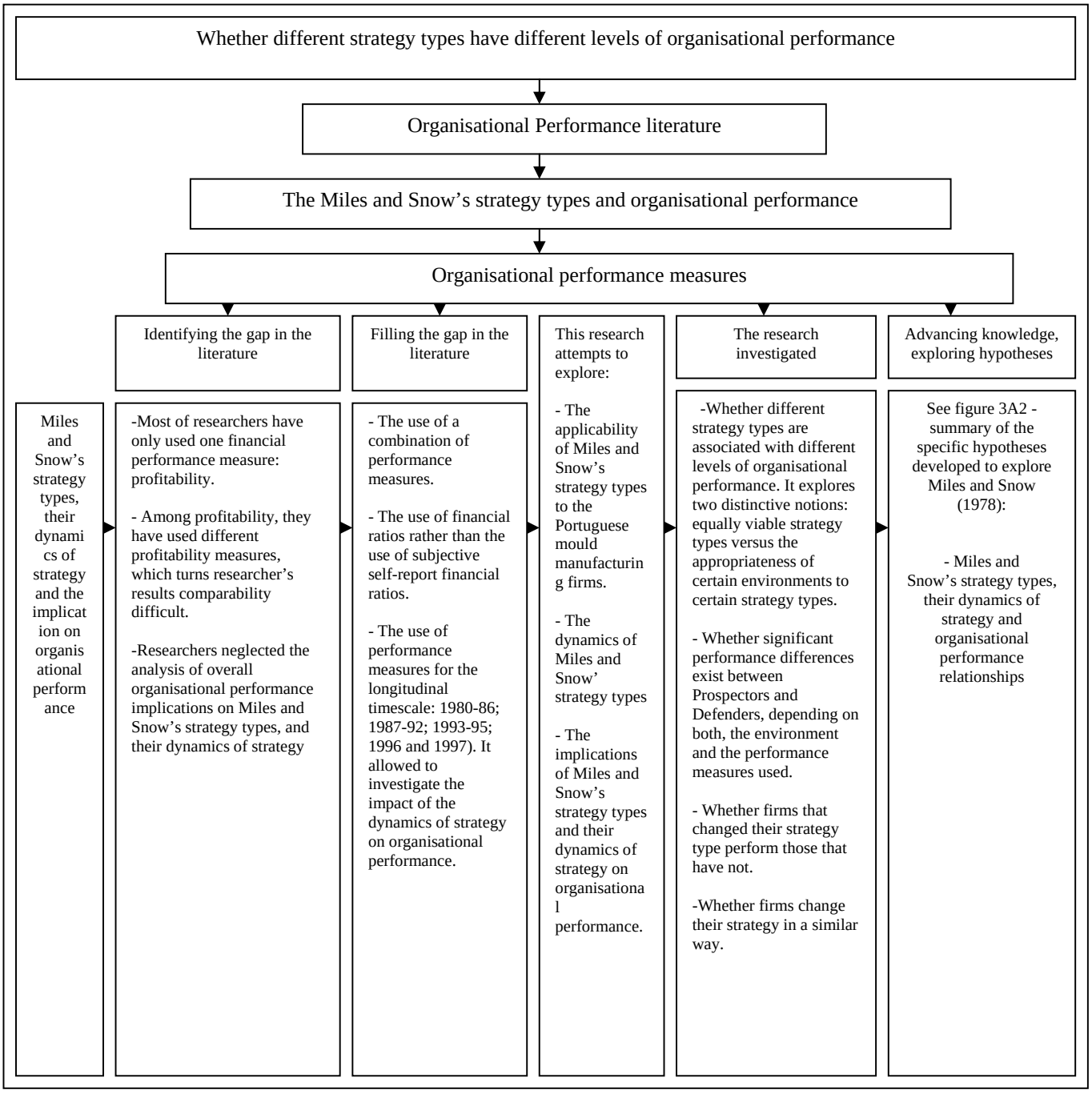


Figure 3A2 - Summary of the specific hypotheses developed to explore Miles and Snow (1978)

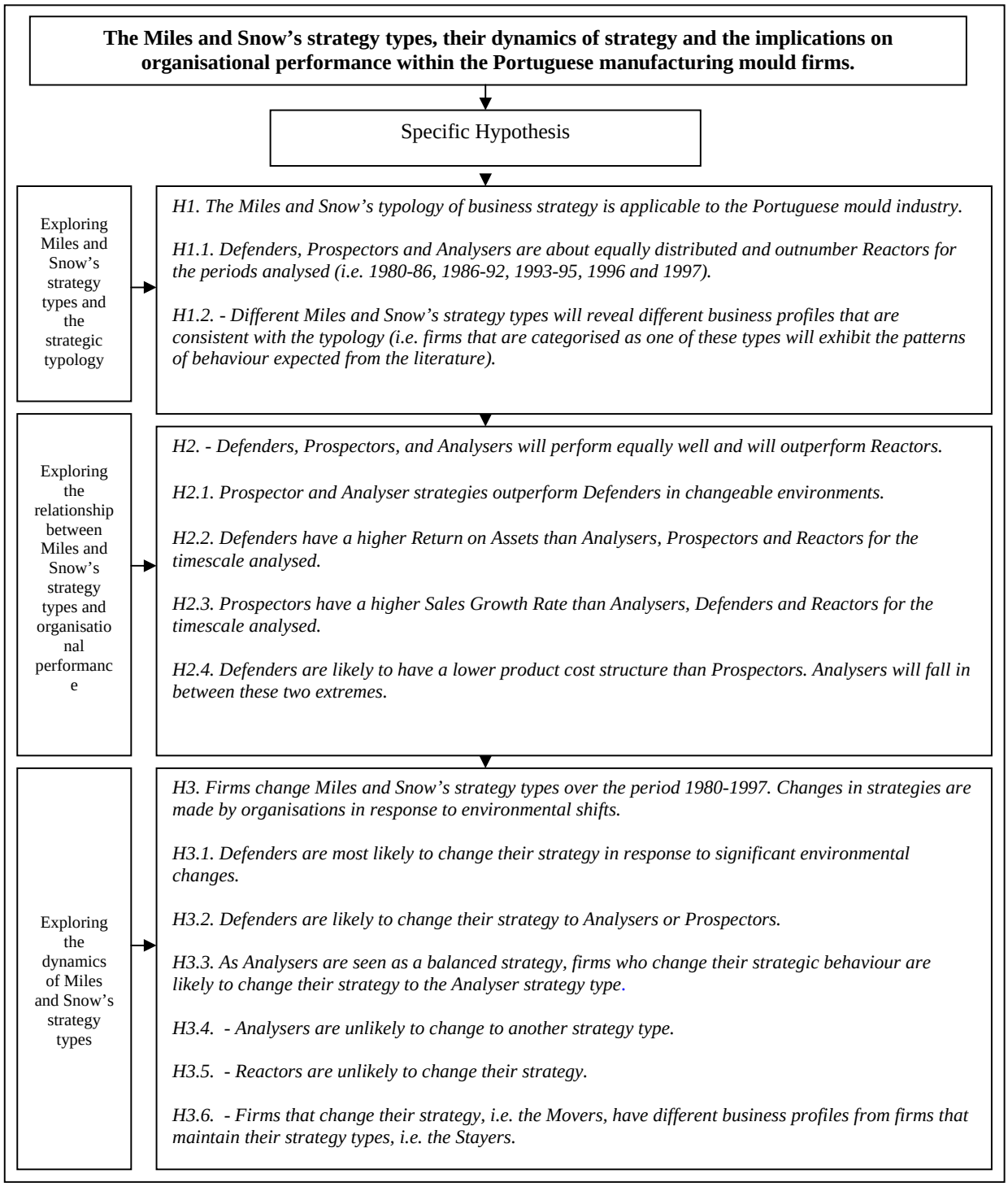
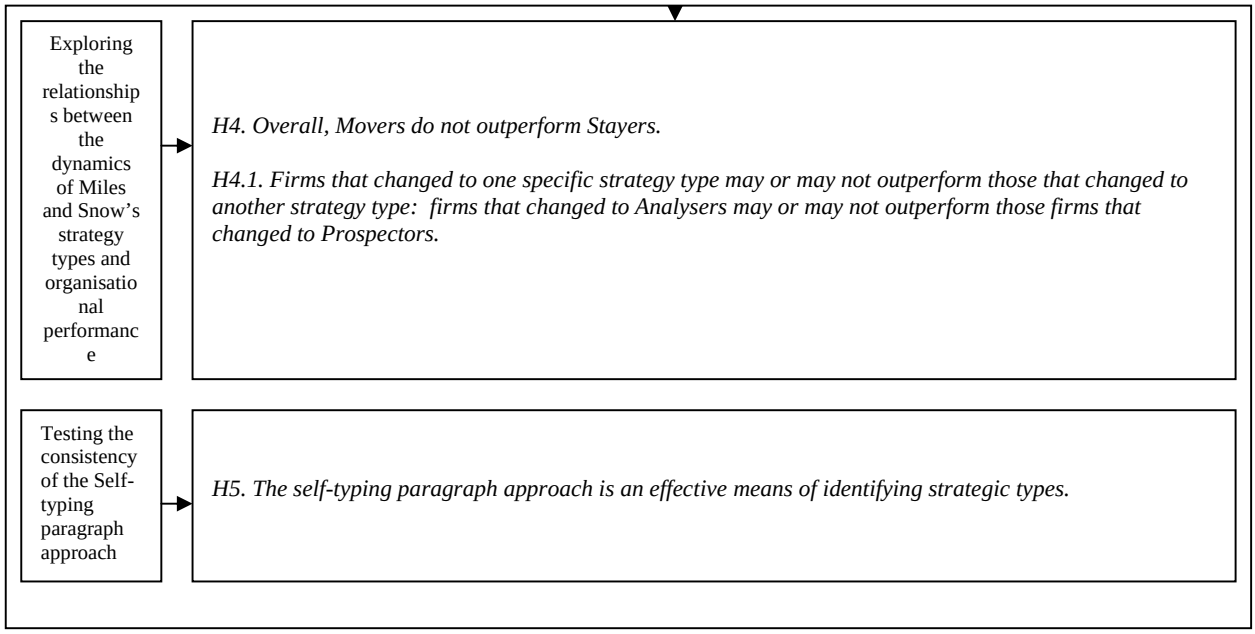


Figure 3A2 Cont. - Summary of the specific hypotheses developed to explore Miles and Snow (1978)



Appendix 4

The Research Methodology

Appendix 4A - In-depth interviews

In-depth interviews

The questions were used as a guide during the interview. The interviews have allowed for the development of new issues, at the same time remaining focused on the field of business strategy within the Portuguese mould industry. The majority of the questions were asked during the interviews, but not necessarily in the order, which they are presented below. Top managers were encouraged to talk about their experiences and beliefs. Assurance was given that confidentiality and anonymity of the information would be kept.

- What business is your organisation in?
- What is your organisation's strategy?
- What type of mould are you selling?
- To which markets are you selling?
- What is the organisation's marketing policy?
- Does your organisation invest?
- In what your organisation has been investing?

- Has your organisation changed its strategy over the period, 1980-1997?

- Who are the organisation's customers?
- Have the organisation's customers changed over the years?

- What is your organisation's philosophy?

- What are the organisation's key competitive advantages?

- What are your organisation's strengths and weaknesses?
- What are your organisation's opportunities and threats?

- Who are the organisation's competitors?

- Has competition changed over the period, 1980-1997?

- What are the most significant changes that have occurred in the environment over the period, 1980-1997?

- Has your organisation changed its strategy in response to the environmental changes?

- Why has your organisation changed strategy?

- Have environmental changes affected your organisation's business strategy?

- How do you see the organisation in the future?

Appendix 4B - Semi-structured interviews

Semi-structured interviews

The semi-structured interviews allowed a higher degree of questions standardisation compared with the in-depth interviews, without threatening its flexibility characteristics, i.e. the exploration of new emergent issues.

- What is your organisation's strategy?
- What type of mould is your organisation selling?
- Has your organisation changed the type of the mould sold over the period, 1980-97?

- What is the organisation's capacity for the complete manufactured mould?
  - □ less than 250kg □ 250-749kg □ 750-1999kg □ 2000kg-4999kg
  - □ 5000kg-9999kg □ 10000-20000kg □ over 20000kg
- Has your organisation changed the capacity of the manufactured mould over the period, 1980-97?

- What is the organisation's complexity level for the manufactured mould?
  - □ High complexity □ moderate complexity □ simple complexity
- Has your organisation changed the complexity of the manufactured mould over the period, 1980-97?

- Who are your industry clients?
  - □ Automobile □ Electric/Electronical □ Domestic appliances
  - □ Toys □ Domestic utilities
  - □ Others? ----------
- Has your organisation changed its clients over the period, 1980-97?

- Which market does your organisation sell to?
  - □ Portugal □ UK □ USA □ France
  - □ Germany □ Spain □ Brazil □ Others? ----------
- Have your markets changed over the period, 1980-97?

- What is your organisation's marketing policy for the external markets?

- Does your organisation invest in technology?
- What type of technology does your organisation have?
  - □ Conventional equipment □ CAD/CAM/CAE systems
  - □ CNC systems □ EDM equipment
  - □ Wire cutting equipment □ Laser equipment
  - □ Quality control equipment □ Injection test equipment
  - □ Others----------
- Has your organisation changed its technology over the period, 1980-97?

Appendix 4B - Semi-structured interviews (cont.)

Semi-structured interviews (cont.)

- Does the organisation have a training policy?

- Who are the organisation's customers?
- What are your customers' requirements?
- Have your customers' requirements changed over the period, 1980-97?
- What are your customers demanding?
- Have your customers' demands changed over the period, 1980-97?
- How long have you been dealing with your customers?
- What benefits are you offering to your customers?
- Have the organisation's customers changed over the period, 1980-97?

- Who are the organisation's competitors?
- Where are your organisation's competitors located?
- What are your organisation's competitors doing?
- Has competition changed over the period, 1980-97?

- What is your organisation's competitive strategy?

- What is your organisation's philosophy?

□ low price □ quality □ Image □ Support service alongside the product
□ something that is really truly different □ no basis of differentiation

- What are the organisation's key competitive advantages?
- What are your organisation's strengths and weaknesses?
- What are your organisation's opportunities and threats?

- What were the most significant changes that have occurred in the environment?

- Has your organisation changed its strategy over the period, 1980-97?

- Why has your organisation changed its strategy?

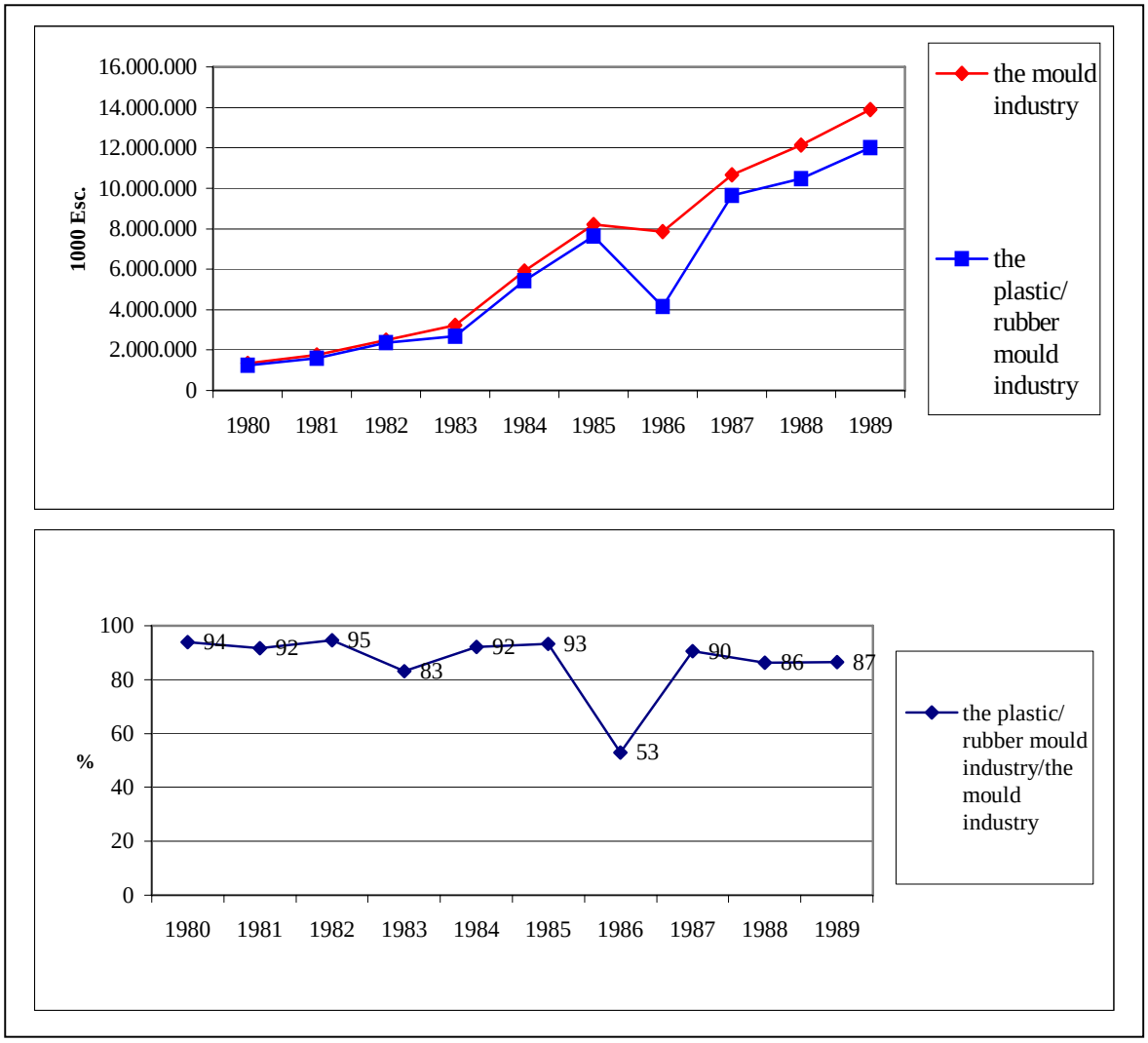
- Have environmental changes affected your organisation's business strategy?

- How do you see your organisation in the future?

Appendix 4C - The importance of the plastic mould manufacturing industry on the mould manufacturing industry

As can be seen during the 80th decade, with the exception in 1986, on average the moulds for plastics/rubber represented more than 80% of the total exports of the mould industry. Although within this group it is important to emphasise that the moulds for rubber only represent 5% of the total exports (ICEP, 1996). Thus analysing the plastic mould manufacturing industry is analysing almost the totality of the sector.

Figure 4Ca - the importance of the plastic/rubber manufacturing mould industry on the mould industry, exports 1980-89



Source: INE - The National Institute of Statistics
Value calculated at current prices

Table 4Ca - The importance of the plastic/ rubber manufacturing mould industry on the mould industry, exports 1980-1989

	84.60. for the mould industry				84.60.71. moulds for the plastic and rubber industry			
	Exports				Exports			
Years	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc	Growth rate	Value/T
1980	1.496	1.337.970		895	1.356	1.256.070		926
1981	1.393	1.758.881	31,5%	1.263	1.244	1.611.226	28,3%	1.295
1982	1.650	2.502.070	42,3%	1.516	1.454	2.364.838	46,8%	1.626
1983	1.659	3.237.658	29,4%	1.951	1.345	2.690.782	13,8%	2.001
1984	2.228	5.892.853	82,0%	2.645	1.931	5.421.923	101,5%	2.807
1985	2.547	8.197.400	39,1%	3.219	2.232	7.646.424	41,0%	3.426
1986	2.580	7.847.389	-4,3%	3.042	1.332	4.145.348	-45,8%	3.112
1987	3.346	10.661.811	35,9%	3.186	2.949	9.645.348	132,7%	3.271
1988	3.338	12.149.611	14,0%	3.640	2.804	10.470.916	8,6%	3.734
1989	3.680	13.877.091	14,2%	3.771	3.401	12.004.929	14,7%	3.530
Total	23.917	67.462.734		2.821	20.047	57.257.804		2.856

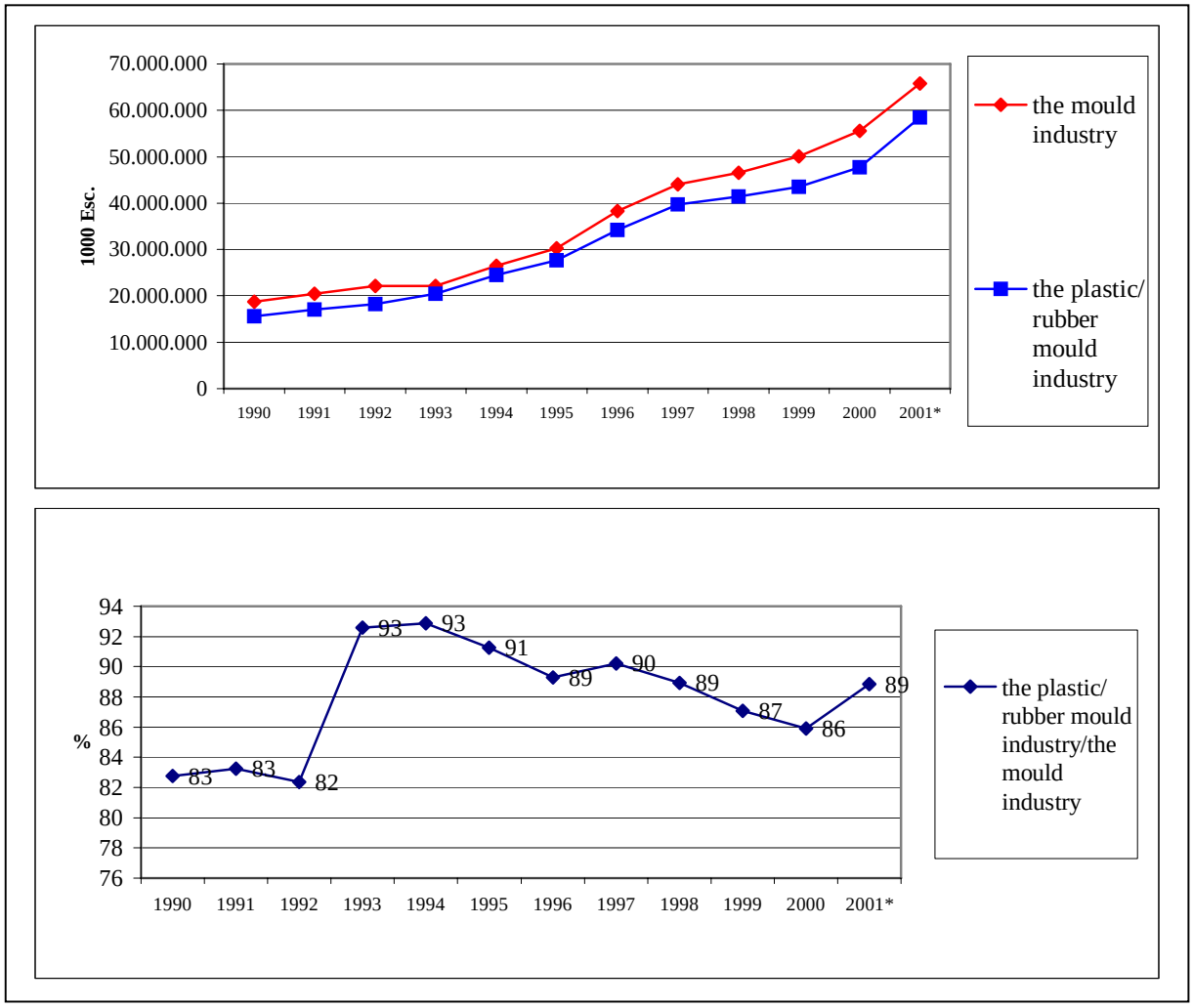
Source: INE - The National Institute of Statistics
Value calculated at current prices
84.60. - is the custom nomenclature code for the mould industry
84.60.71. - is the custom nomenclature code for the plastic and rubber industry

Concurrently to the 80s trend, in the 90s the plastic mould industry continues to be far the most representative, accounting, especially after 1993, for almost 90% of the mould industry exports. Therefore due to its representativeness, analyse the plastic mould industry is almost synonymous with the analysis of the mould industry, i.e. firms that are manufacturing moulds, are in fact manufacturing moulds for plastics.

In our daily life we are bounded with a variety of products with plastic applications e.g. the alarm clock, the radio, the toothbrush, most of the automobile interiors, the kettle, the fridge, the television, etc. Because of the undoubted competitive advantages of plastic; its use has been extended to a remarkable degree, edging out more traditional materials. Plastic is light, is resistant (to be breakable, corrosion and chemicals) is an isolator (of sound, vibration and electric shock) has design flexibility and has lower processing and finishing costs than other materials (see Rodrigues, in *O Molde*, 1997). It is foreseeable that the demand for plastics will increase,

stimulated by the growth of some industries, such as: packaging (food, beverage, cosmetic, toilet, pharmaceutical, and house hold goods) automobile (external, motor and mechanical applications), building construction (pipes, tubing, windows and doors) household appliances, electric/electronic (wires, cables, miniaturisation and portability within computers, printers, copiers and cellular phones) and medical (diagnostic and therapeutic equipment for home use, toward hospital costs control). Consequently the mould industry will be pulled up by this growth. There will be an incommensurable number of plastic products as well as moulds to manufacture.

Figure 4Cb - The importance of the plastic/rubber manufacturing mould industry on the mould industry, exports, 1990-2001*



Source: INE - The National Institute of Statistics
Value calculated at current prices
*an estimated value

Table 4Cb - The importance of the plastic/rubber mould industry on the mould industry, 1990-2001*

	84.80. HS for the mould industry				84.80.71. HS for the plastic and rubber industry			
	Exports				Exports			
Years	Tones	1000 Esc	Growth rate	Value/T	Tones	1000 Esc	Growth rate	Value/T
1990	4.785	18.800.594		3.929	3.697	15.559.493		4.209
1991	5.018	20.465.274	8,9%	4.078	3.985	17.034.666	9,5%	4.275
1992	5.954	22.111.750	8,0%	3.714	4.392	18.214.357	6,9%	4.147
1993	5.081	22.103.880	0,0%	4.350	4.563	20.465.686	12,4%	4.485
1994	5.968	26.443.352	19,6%	4.431	5.441	24.563.688	20,0%	4.515
1995	6.502	30.295.877	14,6%	4.659	5.735	27.650.461	12,6%	4.821
1996	7.438	38.301.883	26,4%	5.149	6.383	34.204.287	23,7%	5.359
1997	8.534	44.041.780	15,0%	5.161	7.315	39.726.539	16,1%	5.431
1998	9.440	46.580.690	5,8%	4.934	7.959	41.417.098	4,3%	5.204
1999	9.872	50.021.054	13,6%	5.067	8.094	43.564.229	9,7%	5.382
2000	10.475	55.552.560	11,1%	5.303	8.556	47.729.953	15,2%	5.579
2001*	12.007	65.745.666	18,3%	5.476	10.312	58.418.650	34,1%	5.665
Total	79.486	373.377.108		50.450	66.587	328.838.633		4938

Source: INE - The National Institute of Statistics
* an estimated value
84.80. - is the custom nomenclature code of the harmonized system for the mould industry.
84.80.71. - is the custom nomenclature code of the harmonized system for the plastic and rubber industry.

APPENDIX 4D

Questionnaire

This questionnaire is addressed to the manufacturing mould industry.
Please tick the appropriate box or fill in where necessary. Relate to 1996 findings.

1.Organisation details.

1a) Postcode? _____. 1b) Family business? ☐ Yes ☐ No

1c) Nature of ownership?

☐ Sole trader ☐ Public Limit Company-PLC

☐ Associate firms?, if so,

How many associate firms do you have, and have they been created to cover which area?

No of firms	Covered area
____	_____
____	_____
____	_____
____	_____

☐ Partnership, if so,

How many? ☐ 1 - 3 ☐ 4 - 6 ☐ Over 6

2. About the business.

2a) What is the organisation's marketing policy for the external market?

☐ Deals directly ☐ Has agents ☐ Has branches

☐ Deals with Portuguese intermediary firms ☐ Deals with foreign intermediary firms

Others? Please, specify _____

2b) How does the organisation promote itself?

☐ Advertises in specialise magazines ☐ International fair exhibitions

☐ Workshops/seminars/ conferences ☐ Mailing

☐ Trade missions participation Others? _____

2c) Which markets do you currently (1996) operate in, and what percentage of total sales do they represent?

Markets	%	Markets	%	Markets	%
☐ Portugal	-------%	☐ USA	-------%	☐ Spain	-------%
☐ UK	-------%	☐ France	-------%	☐ Sweden	-------%
☐ Germany	-------%	☐ Israel	-------%	☐ Brazil	-------%
Others? Please, _____			-------%	_____	-------%
State:	_____		-------%	_____	-------% _____ -
------%	_____		-------%		
					100%

2d) Have your markets changed in the past?

☐ Yes, if so, ☐ No, go to 2e)

In which countries occurred the **most significant variation** of total sales? Please Include **new** and **abandoned** markets. State approximately the percentage of total sales for the following periods of time. Forecast the trends to 1997. Please follow the example.

Markets	1980-86	1987-92	1993-95	1996	1997
Example: USA	70 %	50 %	30 %	20 %	↘ = ↗
Example: China	-	-	10 %	15%	↘ = ↗
					↘ = ↗
					↘ = ↗
					↘ = ↗
					↘ = ↗
					↘ = ↗

2e) What are the export barriers for your organisation? Please circle on the scale.

	1-Strongly disagree				5- Strongly agree.
- Maturity of the market place	1	2	3	4	5
- Inferior quality	1	2	3	4	5
- Lack of competitive price	1	2	3	4	5
- Lack of competitive delivery time	1	2	3	4	5
- External political uncertainties	1	2	3	4	5
- Strong Escudo	1	2	3	4	5
- Custom barriers	1	2	3	4	5
- Language barriers	1	2	3	4	5

Other factors? Please give details_____

2f) In which of the following industry sectors does your organisation sell? Please state approximately the percentage sales of each industry related to the total sales for the following periods of time. Forecast the trends to 1997. Follow the example.

Industries	1980-86	1987-92	1993-95	1996	1997
Example: Toys	30%	20%	15%	25%	↘ = ↗
Automobile					↘ = ↗
Electric/Electronic					↘ = ↗
Domestic Appliances					↘ = ↗
Toys					↘ = ↗
Domestic Utilities					↘ = ↗
Others?					↘ = ↗
					↘ = ↗
	100%	100%	100%	100%	100%

2g) What is your maximum capacity for complete moulds in kilos? Please tick the appropriate capacity for the following periods of time. Forecast the trends to 1997. Follow the example.

Capacity	1980-86	1987-92	1993-95	1996	1997
Less than 250 Kg					
250-749 kg					
750-1 999 kg					
2 000-4 999 kg					
5 000-9 999 kg					
10 000-20 000 kg					
Over 20 000 kg					

2h) How complex are the moulds produced by you? Please state approximately the percentage related to total moulds manufactured for the following periods of time.

Complexity level	1980-86	1987-92	1993-95	1996	1997
High complexity					
Medium complexity					
Low					
	100%	100%	100%	100%	100%

3 - Investments

3a) Where has your organisation invested? Please state approximately the percentage of the investment related to the organisation's total investment for the following periods of time. Forecast the trends to 1997. Please follow the example.

Investments	1980-86	1987-92	1993-95	1996	1997
Example: Marketing	-	0,5%	1%	1,5%	↘ = ↗
Research & Development					↘ = ↗
Technology (equipment)					↘ = ↗
Infrastructures					↘ = ↗
Marketing					↘ = ↗
Customer relationship					↘ = ↗
Training					↘ = ↗
Others?					↘ = ↗
	100%	100%	100%	100%	

3b) How does your organisation raise the capital for investment? Please state the respective percentage for the following periods of time. Forecast the trends to 1997.

Capital	1980-86	1987-92	1993-95	1996	1997
Self funding					
Partners loan					
Bank loan					
Leasing					
European Community fund					
Others?					
	100%	100%	100%	100%	100%

3c) What constraints does your organisation have to investment? Circle on the scale that applies to you.

	1- Strongly disagree.				5- Strongly agree.
- Doesn't have	1	2	3	4	5
- High interest rate	1	2	3	4	5
- Limit borrow financial options	1	2	3	4	5
- Low capacity of self funding	1	2	3	4	5
- High exchange rate	1	2	3	4	5
- Uncertainties of demand	1	2	3	4	5
- Lack of government support	1	2	3	4	5
- Lack of a skilled workforce	1	2	3	4	5
- Organisation structure	1	2	3	4	5

Others? Please, specify_____

4 - Technology

4a) Where has your organisation been investing in technology? Please state approximately the percentage of investment in technology related to total investment for the following periods of time. Forecast the trends to 1997. Please follow the example.

Technology/investment	1980-86	1987-92	1993-95	1996	1997
Example: CNC system	-	5%	7%	20%	↘ = ↗
Conventional equipment					↘ = ↗
CAD/CAM/CAE systems					↘ = ↗
CNC systems					↘ = ↗
EDM equipment					↘ = ↗
Wire cutting equipment					↘ = ↗
Laser equipment					↘ = ↗
Quality control equipment					↘ = ↗
Injection test equipment					↘ = ↗
Others?					↘ = ↗
	100%	100%	100%	100%	100%

4b) How frequent is the re-engineering process? Tick the table to identify the time-cycle for the technology re-engineering process. Please follow the example.

Technology/re-engineering	1 year	2 years	5 years	10 years	Over 10 years
Example: CNC system			✓		
Conventional equipment					
CAD/CAM/CAE systems					
CNC systems					
EDM equipment					
Wire cutting equipment					
Laser equipment					
Quality control equipment					
Injection test equipment					
Others?					

4c) Have you totally paid the instalments when you are replacing the technology?

☐ Yes ☐ No, if so, Why?

☐ Lack of workforce skills too profitable the equipment

☐ Few orders ☐ Other? _____

4d) Does your organisation work in shifts?

☐ Yes, if so ☐ No, go to 4f)

Please, tick the table to identify the shifts for the respective equipment.

Technology /shifts	1 shift	2 shifts	3 shifts
Example: CNC system			
Conventional equipment			
CAD/CAM/CAE systems			
CNC systems			
EDM equipment			
Wire cutting equipment			
Laser equipment			
Quality control equipment			
Injection test equipment			
Others?			

4f) What is your organisation automation ratio (number of equipment controlled by the number of employees)?

☐ 2 employees for 1 equipment ☐ 1 employee for 1 equipment

☐ 1 employee for 2 equipments ☐ 1 employee for 3 equipments

5 - Workforce

5a) How many of your employees are in the following group and what is their average age, and their hourly cost

	Number of Employees	Average Age	Hour/Cost
☐ Managerial	--------	--------	--------
☐ Supervisory	--------	--------	--------
☐ Technical	--------	--------	--------
☐ Clerical and Administrative	--------	--------	--------
☐ Skilled	--------	--------	--------
☐ Semi-skilled	--------	--------	--------
☐ Unskilled	--------	--------	--------

5b) Has your organisation experienced difficulties in workforce recruitment?

☐ Yes, if so, ☐ No, go to 6a)

Why? Please circle on the scale.

	1-Strongly disagree				5- Strongly agree
- Didn't get any applicants	1	2	3	4	5
- Applicants weren't knowledgeable enough	1	2	3	4	5
- Applicants lacked necessary experience	1	2	3	4	5
- Applicants lacked personal qualities	1	2	3	4	5
- Applicants salary expectations were too high	1	2	3	4	5

Others? Please specify_____

6 - Training

6a) Does your organisation have a training policy?

☐ Yes, if so, ☐ No, go to 6e).

What aspects of training are covered? Please circle on the scale.

	1-Strongly disagree				5- Strongly agree
- Use of technology	1	2	3	4	5
- Product definition	1	2	3	4	5
- Quality control	1	2	3	4	5
- Strategic management skills	1	2	3	4	5
- Marketing	1	2	3	4	5
- Customer relationship	1	2	3	4	5

Others? Please specify. _____

6b) To which extent does your organisation provide the training?

☐ Managerial ☐ Supervisory ☐ Technical

☐ Clerical and Administrative ☐ Skilled ☐ Semi-skilled ☐ Unskilled

6c) Does your organisation require other institutions to conduct their training?

☐ Yes ☐ No

6d) Have you experienced a problem with employees being trained by you and then leaving your employment shortly afterwards? CIRCLE **ONLY ONE**.

A - It happens frequently **B** - It happens occasionally **C**-It happened once
D - Never happened **F** - Don't know

6e) Who does your organisation think has the responsibility for training? Please circle on the scale. 1 - strongly disagree 5 - strongly agree.

- Universities	1	2	3	4	5
- Government	1	2	3	4	5
- Companies	1	2	3	4	5
- Training companies	1	2	3	4	5

Others? Please Specify. _____.

7 - Customers

7a) What benefits does your organisation offer to the customers? Please circle on the scale: 1 - Strongly disagree, to 5 - Strongly agree, to classify the benefits offered to your customers for the following periods of time. Forecast the trends to 1997.

Benefits offered to the customers	1980-86	1987-92	1993-95	1996	1997
Quality	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Delivery time	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Price	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Technology expertise	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Something different and unique	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Post sales support	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Innovation	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Varied range of services	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Trust	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Customer relationship	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5
Others?	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5	1- 2 - 3- 4- 5

7b) What is the average length of time your customer has been dealing with you?

☐ Less than 1 year ☐ 1 - 4 ☐ 5 - 10 ☐ Over 10

8 - Competitors

8a) Where are your main competitors located?

☐ National Market_____ ☐ Overseas Market_____

8b) What are your competitors doing better than you? Please circle on the scale.

1- Strongly disagree 5 -Strongly agree

- Nothing	1	2	3	4	5
- Quality	1	2	3	4	5
- Delivery time	1	2	3	4	5
- Price	1	2	3	4	5
- Technology expertise	1	2	3	4	5
- Something different and unique	1	2	3	4	5
- Post sales support	1	2	3	4	5
- Innovation	1	2	3	4	5
- Varied range of services	1	2	3	4	5
- Trust	1	2	3	4	5
- Customer relationship	1	2	3	4	5
- Marketing	1	2	3	4	5
- Simultaneous engineer process	1	2	3	4	5

Others? Please specify_____

9 - Competitiveness

9a) Please tick on the table below to identify **S**- Strengths; **W**-Weakness; **O**-Opportunities; **T**-Threats and **NA**-Not applicable, if does not apply to you.

Factors	S	W	NA	Factors	O	T	NA
Quality certification				European Eastern countries			
Organisation structure				Maturity of some markets			
Strategic management				New markets			
Strategic planning				Political uncertainties			
Strategy implementation				International economic crisis			
Information feedback				Intermediary-trade firms			
Centralisation				Legislation			
Decentralisation				Bureaucracy			
Simultaneous engineer process				Government support			
Innovation				Portuguese image of mould makers			
Succession				Associateship			
Others?				Others?			

9b) Does your organisation subcontract?

☐ Yes ☐ No, go to 10a)

If so, which areas does your organisation subcontract? Please state approximately the subcontracted percentage related to the organisations total subcontracting for the following periods of time. Forecast the trends to 1997.

Subcontracting	1980-86	1987-92	1993-95	1996	1997
Example: Mould try out	-	3%	5%	5%	6%
Product definition:=>Product design					
Product definition:=>Prototyping					
Mould design					
Mould computer engineering: CAD/CAM/CAE					
Mould manufacture:=>Complete mould					
Mould manufacture:=> Parts of the mould					
Mould try out					
Mould base					
Assembling					
Others? Please, specify					
	100%	100%	100%	100%	100%

9c) What are the reasons for the subcontracting? Please tick the box.

☐ Over load ☐ Without home resources ☐ It is profitable

☐ Because the service or product is casual ☐ Others? _____

9d) To what companies do you subcontract?

☐ Associated firms ☐ National mould companies ☐ Overseas mould companies

☐ Other sectors ☐ Others? _____

10 - Competitive Strategies

10a) Which phases of the organisation process do you want to concentrate on? Tick the box.

- ☐ - Product definition: Product design
- ☐ - Product definition: Prototyping
- ☐ - Mould Design
- ☐ - Mould computer engineering: CAD/CAM/CAE
- ☐ - Mould base
- ☐ - Marketing
- ☐ - Mould Manufacture
- ☐ - Mould try out
- ☐ - Production of plastic pieces
- ☐ - Assembling of plastic pieces
- ☐ - Assembling of plastic pieces with other materials.

Others? _____

10b) Does your organisation have a policy of alliance?

☐ Yes, if so, with who? ☐ No, go to 10c)

☐ Universities ☐ National companies ☐ Overseas companies

☐ Other sectors of the industry ☐ Others? _____

10c) If you are not interested in the customer's order would you recommend him to another national mould company?

☐ It happened several times ☐ It happened just once ☐ Never happened

10d) Choose the sentence, which comes closest to your organisation Philosophy. **Please tick only one**.

Our philosophy is the satisfaction of the customer by offering:

The lowest price. Quality. Our image.

A support service alongside our product, e.g. special credit, warranties, etc.

Something that is really/truly different, with unique features.

No basis on differentiation

10e) Which of the following descriptions most closely fits your organisation, compared with other organisations. **Tick only one.**

Please consider your company as a whole and note that none of the types listed below is inherently "good" or "bad". Choose by circling on the type.

1980-86	1987-92	1993-95	1996	1997
①; ②; ③; ④	①; ②; ③; ④	①; ②; ③; ④	①; ②; ③; ④	①; ②; ③; ④

Type 1 - This company attempts to locate and maintain a secure niche in a relatively stable product or service area. The company tends to offer a more limited range of products or services than its competitors, and it tries to protect its domain by offering higher quality, superior service, lower prices, and so forth. Often this company is not at the forefront of developments in the industry, it tends to ignore industry changes that have no direct influence on current areas of operation and concentrates instead on doing the best job possible in a limited area.

Type 2 - This company typically operates within a broad product-market domain that undergoes periodic redefinition. The company values being "first in" in new product and market areas even if not all of these efforts prove to be highly profitable. The organisation responds rapidly to early signals concerning areas of opportunity, and these responses often lead to a new round of competitive actions. However, this company may not maintain market strength in all of the areas it enters.

Type 3 - This company attempts to maintain a stable, limited line of products or services, while at the same time moving out quickly to follow a carefully selected set of the more promising new developments in the industry. The company is seldom "first in" with new products or services. However, by carefully monitoring the actions of major competitors in areas compatible with its stable product-market base, the company can frequently be "second in " with a more cost-efficient product or service.

Type 4 - This company does not appear to have a consistent product-market orientation. The company is usually not as aggressive in maintaining established products and markets as some of its competitors, nor is willing to take as many risks as other competitors. Rather the organisation responds in those areas where it is forced to by environmental pressures.

11- Business Performance

11a) What is your average product costs structure? Please tick the box and state approximately the percentage (1996).

☐ Raw material ------% ☐ Workforce ------% ☐ Components/ accessories -----%

☐ Subcontracts ------% ☐ Technology------% ☐ Capital costs ------% Other costs? ------%

Please specify_____

100%

11b) Please fill in the below table for the following periods of time. Use an average data for each column: A = data from 1980 + 1986\2; B = data from 1987 + 1992\2 and C = data from 1993 + 1995\2. Data is in thousand of Escudos.

	A	B	C	
Items	1980-86	1987-92	1993-95	1996
Fixed Assets				
Cash				
Debtors				
Other current assets				
Stocks				
Suppliers				
Short Term Liabilities				
Long Term Liabilities				
Equity Capital				
Net profit after tax				
Net sales revenue				
Number of moulds				

Thank you for your collaboration.

Appendix 4E - Variables used

Table 4Ea - Variables utilised in the current study to measure business strategy, organisation performance, and Miles and Snow's strategy types, both from a static and dynamic viewpoint.

		Measuring	Name of the Variable	Data type	Type of Variables
Business Strategy Testing the theory	Miles and Snow's strategy types	Defenders; Prospectors; Analysers; Reactors	type86, type92 type95 type96 type97 with 1–Defenders; 2–Prospectors; 3–Analysers; 4–Reactors	Nominal	Independent
Business Strategy Strategic dimensions	•Product-market domain	Capacity of the manufactured mould	capaci86; capaci92; capaci95; capaci96; capaci97 with 1- less than 250 kg 2 –250-749Kg 3-750-1.999Kg 4-2.000-4.999Kg 5-5.000-9.999Kg 6 -10.000-20.000Kg 7-Over 20.000Kg	Ordinal	Independent
		Complexity of the manufactured mould: high, moderate and simple	cplexh86; cplexh92; cplexh95; cplexh96; cplexh97; cplexm86; cplexm92; cplexm95; cplexm96; cplexm97; cplexs86; cplexs92; cplexs95; cplexs96; cplexs97;	Interval	Independent
		Client industries: Automobile, Electric/electronical, Domestic appliances Toys, Domestic utilities and Others industries	indaut86; indaut92 ; indaut95; indaut96; indaut97; indele86; indele92 ; indele95; indelet96; indele97; indapp86; indapp92 ; indapp95; indappt96; indapp97; indtoy86; indtoy92 ; indtoy95; indtoy96; indyoy97; induti86; induti92 ; induti95; induti96; induti97; indoth86; indoth92 ; indoth95; indoth96; indoth97;	Interval	Independent
		Markets: Portugal, UK, Germany, USA, France, Israel, Spain, Sweden, brazil and others changed markets: USA, Germany, Brazil, UK, France, Portugal, Israel, Others	mpt,; muk.; mgermany; musa; mfrance; misrael; msapin, msweden, mbrazil, mothers chgusa86; chgusa92; chgusa95; chgusa96; chgusa97; chgger86; chgger92; chgger95; chgger96; chgger97; chgbra86; chgbra92; chgbra95; chgbra96; chgbra97; etc	Simultaneously ordinal and Interval	Independent
		Services-product enlargement: Product definition- product design; Product definition-prototyping; Mould design; Mould computer engineering:CAD/CAM/CAE; Mould base; Mould manufacture; Mould try out; production of plastic pieces; Assembling of plastic pieces; Assembling of plastic pieces with other materials; Marketing; other.	stgpddes; stgpdpro; stgmdesi; stgmceng; stgmbase; stgmmanu; stgmtryo; stgplast; stgassep; stgasseo; stgmarkt; stgother	Nominal	Independent
		Marketing policy : marketing ; promotion	marktpol; promote	Nominal	Independent
		Organisation philosophy – lowest price-; quality; image; support service alongside the product; something different; no basis of differentiation	philosop	Nominal	Independent

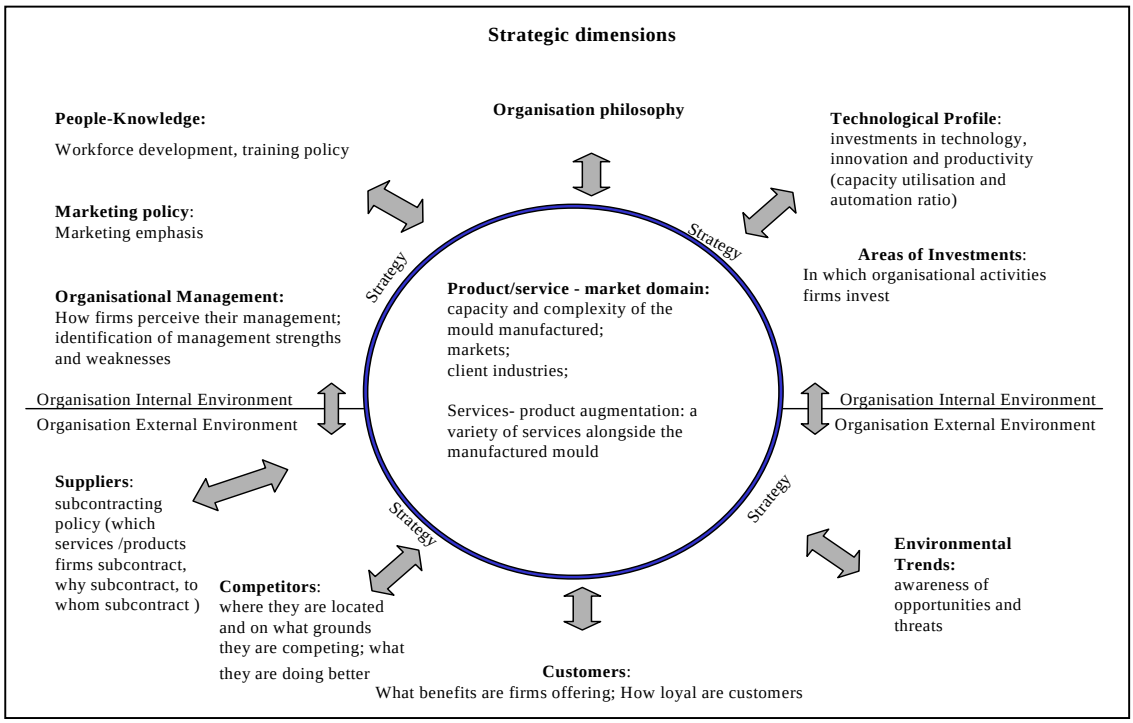
		Organisational management-strengths, weaknesses, not applicable: quality certification, strategic planning; organisation structure; centralisation; decentralisation; information feedback; simultaneous engineer process; innovation	swqcerti; swstrpla; swstruct; swcentra; swdecent; swifeedb; swseproc; swinnova	Nominal	Independent
	•Investments	Areas of investment: R&D, Technology, Infrastructures, Marketing, Customer relationship, Training	Invrd86; Invrd92; Invrd95; Invrd96; Invrd97; Inveqp86; Inveqp92; Inveqp95; Inveqp96; Inveqp97; Inifr86; Inifr92; Inifr95; Inifr96; Inifr97; Invmkt86; Invmkt92; Invmkt95; Invmkt96; Invmkt97; Incus86; Incus92; Incus95; Incus96; Incus97; Invtrn86; Invtrn92; Invtrn95; Invtrn96; Invtrn97;	Interval	Independent
Business Strategy Strategic dimensions	•Technology	Investments in technology: conventional; CAD/CAM/CAE systems; CNC systems; EDM; Wire cutting; Laser; quality control; and Injection test	teccon86; teccon92; teccon95; teccon96; teccon97; teccad86; teccad92; teccad95; teccad96; teccad97; teccnc86; teccnc92; teccnc95; teccnc96; teccnc97; tecedm86; tecedm92; tecedm95; tecedm96; tecedm97; tecwct86; tecwct92; tecwct95; tecwct96; tecwct97; teclas86; teclas92; teclas95; teclas96; teclas97; tecqlc86; tecqlc92; tecqlc95; tecqlc96; tecqlc97; tecinj86; tecinj92; tecinj95; tecinj96; tecinj97;	Interval	Independent
		Frequency of the re-engineering process, shorter time cycles	reecon; reecad; reecnc; reeedm; reewct; reelas; reeqlc; reeinj	Ordinal	
		Working to full capacity utilisation: work in shifts, automation ratio	shiftcon; shiftcad; shiftcnc; shifedm; shifwct; shiflas; shifqlc; shifinj automcon; automcad; automcnc; automedm; automwct; automlas; automqlc; autominj	Ordinal Nominal	
	•People-knowledge	Number of employees	nemploye	Interval	Independent
		Workforce categories: managerial; Supervisory; Technical; Clerical and Administrative; Skilled; Semi-skilled;Unskilled	nmanager; nsupervi; ntechnic; ncladmin; nskilled; nsemisk; nunskill	Interval	
		Average age	averaage; agemanag, agesuper; agetechn; agecladm; ageskill; agesemis; ageunski	Interval	
		Hour/cost	hcostman, hcostsup; hcosttec; hcostcla; hcostski; hcostssk; hcostuns	Interval	
		Training policy	training	Nominal	
		what covers: technology use; product definition; quality control; strategic management skills; trading; customers relationship	trntechg; trnprodd; trnqltct; trnstrgm; trnmarkt; trncustr	Ordinal	
		to who is provided; who provides	providtr othorgtr	Nominal Nominal	
	•Customers	Benefits offered: quality Delivery time; Price; Technology expertise; Something different and unique, Innovation Varied range of services Customer relationship	bfcqlt86; bfcqlt92; bfcqlt95; bfcqlt96; bfcqlt97 bfcdl86; bfcdl92; bfcdl95; bfcdl96; bfcdl97 bfcpr86; bfcpr92; bfcpr95; bfcpr96; bfcpr97 bfctng86; bfctng92; bfctng95; bfctng96; bfctng97 bfcdif86; bfcdif92; bfcdif95; bfcdif96; bfcdif97 bfcinn86; bfcinn92; bfcinn95; bfcinn96; bfcinn97 bfcvrs86; bfcvrs92; bfcvrs95; bfcvrs96; bfcvrs97 bfccus86; bfccus92; bfccus95; bfccus96; bfccus97	Ordinal	Independent
		Customer loyalty- dealing with customer	dealcust	Nominal	

	•Competitors	Where they are located: Portugal, France; Germany; Italy; USA/Canada; Asia What they are doing better: nothing,; Quality; Delivery time; Price; Technology expertise; Something different and unique, Post sales support, Innovation; Varied range of services; Trust, Customer relationship, Marketing, Simultaneous engineer process	cmppt; cmpgerma; cmpitaly; cmpfranc, cmpusa/ca; cmpasia; cmpeast, cmpoth cmpbtnot; cmpbtqlt; cmpbtdl; cmpbtpr; cmpbttng; cmpbtdif; cmpbtpss, cmpbtinn; cmpbtvrs; cmpbttru, cmpbtcus, cmpbtmkt, cmpbtsep	Nominal Ordinal	Independent
	• Suppliers	Subcontracting policy: Does the organisation subcontract What subcontracts: Product definition- product design; product definition-prototyping; Mould design; Mould computer engineering:CAD/CAM/CAE; Mould manufacture-complete mould Mould manufacture-parts of the mould Mould try out Mould base Assembling Why, To whom	subcontr subpdd86; subpdd92; subpdd95; subpdd96; subpdd97; subpdp86; subpdp92; subpdp95; subpdp96; subpdp97 submde86; submde92; submde95; submde96; submde97 submce86; submce92; submce95; submce96; submce97 submcm86; submcm92; submcm95; submcm96; submcm97 submpm86; submpm92; submpm95; submpm96; submpm97 subtry86; subtry92; subtry95; subtry96; subtry97; subbas86; subbas92; subbas95; subbas96; subbas97 subass86; subass92; subass95; subass96; subass97 whysub towhosub	Nominal Interval Nominal Nominal	Independent
	• Environmental trends	Identification of the environmental trends-strengths, weaknesses, not applicable: European Eastern countries, maturity of some markets, New markets, political uncertainties, International economic crisis, Intermediary-trade firms, Legislation, Bureaucracy, Government support, Portuguese image of the mould makers, Associateship	oteast, otmatmkt,otnewmkt, otpolunc, oteconcri, ottrade, otlegisl, otbureau, otgovsup, otpimag, otassoci,	Nominal	Independent
Organisational Performance	Non financial measures	Product cost structure: raw material; subcontracts; workforce; technology; components/accessories; capital costs; others	costrmat; costsubc; costwork; costtng; costcass; costcapi; costoth	Interval	Dependent
	Financial measures	Profitability: profit margin Return on equity-ROE Return on assets-ROA Sales growth rate-SGR Return on sales-ROS Asset intensity ratio Sales per employee Profit per employee Overall firm performance for: profit margin Return on equity-ROE; Return on assets-ROA Sales growth ; Return on sales; Asset intensity ratio; Sales per employee , Profit per employee	profit86; profit92; profit95; profit96 roe86; roe92; roe95; roe96 roa86; roa92; roa95; roa96 salgrw86; salgrw 92; salgrw 95; salgrw 96 ros86; ros92; ros95; ros96 assint96 salemp96 prfemp96 ovprof96; ovroe96; ovroa96; ovsgrw96; ovros96; ovasst96; ovsemp96; ovpemp96	Ratio Ratio	Dependent Dependent
	Non financial measures	Number of moulds	nmoul86;nmoul92; nmould95; nmould96	Interval	Dependent

Appendix 4F - Strategic Dimensions

The current research has developed a number of "strategic dimensions" (term designated by Porter, 1980) that endeavours to cover different possible strategic choices of the firm. Strategic dimensions were constructed based on the literature. They measured both the organisation and its external environment. The organisation strategic dimensions include: organisation domain: market - product/service (capacity and complexity of the mould manufactured; markets; client industries; services- product augmentation: a variety of services alongside the manufactured mould, and marketing policy), areas of investments, technological profile (investments in technology, innovation and productivity), people-knowledge (organisational size, workforce development; training policy), and organisational management (the identification of management strengths and weaknesses). The external organisational strategic dimensions comprise: customers (benefits offered and customer loyalty); competitors (where they are located and on what grounds they are competing; what they are doing better); suppliers (subcontracting policy: which services /products firms subcontract, why subcontract, to whom subcontract) and environmental trends (the identification of opportunities and threats). Figure 4Fa illustrates the strategic dimensions.

Figure 4Fa- Strategic dimensions



Appendix 4G - Quality definition

Quality definition

Taking in consideration the definition of quality given by Feigenbaum, (1991), i.e.

> *Quality is to produce the product that leave and remain the customer satisfied,*

Identify the quality of the moulds offered by your organisation for the period analysed, 1980-97.

Degree of complexity of the mould manufactured

Identify in your opinion the organisation's degree of complexity for the moulds manufactured in the period analysed, 1980-97, knowing that a basin are considered as requiring simple degree of complexity and a set of electrical parts that are interconnected, entail on average a high degree of complexity for the mould to be manufactured.

Appendix 4H - The SPSS quantitative data analyses based on Bryman and Cramer (1999)

Figure 4Ha - *Bivariate analysis*: i) Exploring differences between scores on two variables; ii) Exploring relationships between two variables as suggested by Bryman and Cramer (1999: chapter 7-10)

Bivariate analysis - Exploring differences between scores on two variables		
Categorical variables and non-parametric tests	*Binomial test for one dichotomous variable*	Is used to compare the frequency of cases actually found in the two categories of dichotomous variables with those which are expected on same basis
	Chi-square test for one sample – X^2	Is used to compare the observed frequencies of cases with those expected in a variable, which has more than two categories. Chi-square is based on comparing the expected with the observed frequency in each cell.
	Chi-square test for two or more unrelated samples - X^2	Is used to compare the frequency of cases found in one variable in two or more unrelated samples or categories.
	McNemar test for two related sample	Is used to compare the frequencies of a dichotomous variable from the same cases at two points in time, in two treatments, or from two samples, which have been matched to be similar in certain respects such as having the same distribution of age, gender, and socio-economic status.
	Cochran Q test for three or more related samples	Is used to compare the distribution of a dichotomous variable across three or more related samples.
	Kolmogorov-Smirnov test for one sample	Is used to compare the observed frequencies of the values of an ordinal variable, against some specified theoretical distribution. It determines the statistical significance of the largest difference between them. In SPSS the theoretical distribution can be Normal, Uniform, Poisson or Exponential. The lowest and the highest values in the sample data will be compared. The sample mean and standard deviation are used for the normal and the sample mean for the Poison distribution. If *p* is below the two-tailed 0.05 level, means that the difference is significant, and that the number of cases at each of the levels is not equal.

Non-categorical variables and non-parametric tests	*Kolmogorov-Smirnov test for two unrelated samples*	Is used to compare the distribution of values in two groups. When the number of participants in both groups is not equal and below 40, the chi-square tables should be consulted. The degrees of freedom in these circumstances are always 2. The chi-square value for 2 degrees of freedom confirms that this difference is non-significant, i.e. there is no difference in the distribution of the variables.
	Median test for two or more unrelated samples	Is used to determine if the distribution of values either side of a common median differs for two or more unrelated samples. When *p* is greater than 0.05 means that is not significant, and therefore the variables do not differ.
	Mann-Whitney U test for two unrelated samples	Is more powerful that the median test because it compares the number of times a scores from one of the samples is ranked higher than a score from the other sample, rather than the number of scores which are above the median. If the two groups are similar, then the number of times this happens should also be similar for the two groups. When *p* is greater than 0.05 there is no difference between variables in the mean ranking of the rated variable.
	Kruskal-Wallis H test for three or more unrelated samples	As in the previous test, the cases in the different samples are ranked together in one series. It used to compare scores in more than two groups. When *p* is greater than 0.05on both tests, this indicates that there is no difference between variables in the mean ranking of the rated variable.
	Sign test for two related samples	It compares the number of positive and negative differences between two scores from the same or similar (i.e. matched) and ignores the size of these differences. If the two samples are similar, then these differences should be normally distributed. If the number of positive differences (i.e. decreases in ratings) was similar to the number of the negative ones (i.e. increases in ratings) this would mean that there was no change in one particular direction between the two occasions.
	Wilcoxon matched-pairs signed-ranks test for two related samples	Like the previous test it takes into account the size of the differences between two sets of related scores by ranking them summing up those with the same sign. If there are no differences between two samples, then the number of positive signs should be similar to that of the negative ones.
	Friedman test for three or more related samples	It compares the scores of three or more related samples across three related samples. It ranks the scores for each of the cases and then calculates the mean rank score for each sample. If there are no differences between the samples, their mean ranks should be similar. The non-significant chi-square means there is no difference in the mean ranks of the variable across the three related samples.

Non-categorical variables and parametric tests	*t test for one sample*	Is used to determine if the mean of a sample is similar to that of the population. One of the assumptions of many parametric tests is that the population of the variable to be analysed should be normally distributed. The one-sample *t* test compare the mean of a sample with that of the population in terms of how likely it is that difference has arisen by chance. The smaller this difference is, the more likely it is to have resulted from chance.
	t test for two unrelated means	Is used to determine if the means of two unrelated samples differ. It does this by comparing the difference between the two means with the standard error of the difference in the means of different samples. The near the difference in the means of two samples is to zero, the more likely it is that this difference is due to chance. To get to know the standard error of the difference in means of the population it is need to use Levene's test. If Levene's test is significant, i.e. has a probably of 0.05 or less, then the variances are unequal ans so the separate variance estimate is used to calculate the t value.
	One-way analysis of variance for three or more unrelated means	This is essentially an *F* test in which an estimate of the between-groups variance (or mean-square, as the estimate of the variance is referred to in analysis of variance) is compared with an estimate of the within-groups variance by dividing the former by the latter. When *F* test is non-significant, means that there is no significant difference. The F test tells us only whether there is a significant difference between one or more of the groups. It does not inform us where this difference lies.
	Levene's test for three or more unrelated variances	Is used to determine whether the variances, rather than the means, of three or more unrelated samples were different. We need to find out if it is appropriate to use analysis of variance to test for mean differences, since this statistic is based on the assumption that the variances of the groups do not differ too widely. In fact, if the number of subjects in each group and their variances are unequal, then it is necessary to use a non-parametric test.
	T test for two related means	Is used to compare the means of the same participants in two conditions or at two points in time. The differences between a related and unrelated *t* test lies essentially in the fact that two scores from the same person are likely to vary less than two scores from two different people. For instances, if p=0.742 mean variable does not differ between the two points in time.
	T test for two related variances	Is used to determine whether the variances of two related samples are significantly different from one another.

	Multivariate analysis of variance for three or more related means	Is used to compare three or more means from the same or matched subjects. Multivariate tests assess the significance of the repeated-measures. When the values for both the multivariate and univariate tests are not significant that signifies that there is no difference in mean variable over the points in time analysed.

Bivariate analysis - Exploring relationships between two variables It analyses how two variables are related to each other. There is a relationship between two variables when the distribution of values for one variable is associated with the distribution exhibited by another variable, i.e. the variation exhibited by one variable is patterned in such way that its variance is not randomly distributed in relation to the other variable.		
Crosstabulation	*Crosstabulation and statistical significance: the chi-square X^2 test* *Between* ***nominal-nominal,*** *between* ***nominal-ordinal*** *between* ***interval-ordinal*** *for few of both categories* *between* ***interval-nominal*** *variables* *To test for strength of association, Cramer's V can be used*	The crosstabulation table is often called of contingency table. A relationship does not imply a perfect correspondence between the two variables. It is needed to know the probability that there is a relationship between two variables in the population from which a random sample was derived. To test this probability the chi-square (X^2) test is used in conjunction with contingency tables. This is a test of statistical significance allowing **ascertaining the probability** that the observed relationship between two variables **may arise by chance**. In seeking to discern whether a relationship exists between two variables in the population from which a random sample was selected, the null hypotheses would need to be rejected. If the null hypotheses is confirmed, the proposition that there is a relationship must be rejected. **The chi-square test entails a comparison of actual frequencies with those, which would be expected to occur on the basis of chance alone – the expected frequencies.** If the computed chi-square value is significant at the 0.05 level of statistical significance, we are saying that we would expect that a maximum of 5 in every 100 possible randomly-selected samples that could be drawn from the population might appear to yield a relationship between them in that population. In order to relate the chi-square value to the significance level it is necessary to establish the number of degree of freedom associated with a crosstabulation.: (number of columns-1)(number of rows-1). If NS (i.e. non-significant) p>0.05 means that the chi-square value is below that necessary for achieving the 0.05 level, meaning that there is more than a 5% chance that there is no relationship in the population. Limitations of the chi-square analysis: First - the chi-square is not a strong statistic, it does not give information about the strength of a relationship. Second- the combination of a contingency table and chi-square is most likely to occur when either both variables are nominal or when one is nominal and the other is ordinal Third – the chi-square should be adapted for use in relation to a 2 x 2 table, i.e. Yate's correction. Fourth – chi-square can be unreliable if expected cell frequencies are less than five. Although this is controversial with Yates's correction for 2 x 2 tables.

Correlation	*Linear correlation: relationships between* ***interval – interval*** *variables*	Unlike chi-square, measures of correlation indicate both the strength and the direction of the relationship between a pair of variables. For interval/ratio variables the most common measure of correlation is Pearson's *r* coefficient. To illustrate correlation features, scatter diagrams or also called scattergrams are employed. They represent for each case the points at which two variables intersect. Each point of the scatter diagram represents each respondent's position in relation to each of these two variables. If the pattern of the points moves downwards from left to right, this imply a negative relationship, meaning, that as one variable increases the other decreases. If the pattern of the points moves upwards from left to right, this implies a positive relationship, i.e. as one variable increases the other also increases. For a perfect linear relationship all of the points in the scatter diagram would be on a straight line. If there is a large amount of scatter no pattern will be visible, which means that there is no or virtually relationship between two variables. When the relationships between two variables are non-linear, i.e. not straight, but curves at one or more points we have curvilinear relationships. Scatter diagrams show: a) whether the relationship is linear, b) the direction of the relationship, i.e. positive or negative, and c) the strength of the relationship. The amount of scatter is indicative of the strength of the relationship. Scatter diagrams are useful aids to the understanding of correlation. Pearson's r allows the strength and direction of linear relationships between variables to be gauged. Pearson's *r* varies between –1 and +1. A relationship of –1 or +1 would indicate a perfect relationship, negative or positive respectively, between two variables. A complete absence of a relationship *r* would be zero. The closer r is to 1(whether positive or negative) the stronger the relationship between two variables. The near *r* is to zero, the weaker the relationship. To evaluate a correlations as suggested by Cohen and Holiday (1982), 0.19 and below is very low; 0.20 to 0.39 is low; 0.40 to 0.69 is modest; 0.170 to 0.89 is high; and 0.90 to 1 is very high. However these values should be taken as indicative. Correlation is not the same as cause. It cannot be determine from an estimate of correlation that one variable causes the other, since correlation provides estimates of covariance, i.e. that two variables are related. What is and is not significant is profoundly affected by the number of cases. The size of *r* and the significance level must be considered in tandem. The test of statistical significance tell us whether a correlation could have arisen by chance (i.e. sampling error) or whether it is likely to exist in the population from which the sample was selected. If r=0.7 and p<0.01 there is only one chance in 100 that we could have selected a sample that shows a relationship when none exists in the population. We could almost conclude that the relationship is statistically significant. If r=0.7 and p=0.1, there are 100 chances in 100 that we have selected a sample which shows a relationship when none exists in the population. Relationship is non-significant. In order to employ Pearson's *r*, variables must be interval and the relationship linear.

Regression	*Rank correlation: relationships between* ***ordinal-ordinal Interval-ordinal*** *Variables*	To examine the relationships between pairs of ordinal variables Spearman's rho (ρ) and Kendall's tau (τ) can be used. Spearman's rho (ρ) is often more used by researchers. The interpretation of the results is much like Pearson's *r*. Unlike Pearson's *r*, rho and tau are non-parametric methods, which means that they can be used in a wide variety of contexts since they make fewer assumptions about variables.
Regression	*Linear regression: relationships between* ***interval – interval*** *variables*	Regression explores relationships between pairs of variables. It is a powerful tool for summarising the nature of the relationship between variables and for making predictions of likely values of the dependent variables. The idea of regression is to summarize the relationship between two variables by producing a line, which fits the data closely. This line is called the *line of best fit. Y=a+bx+e.* Once is known the best fit, we can make predictions about likely values of the dependent variable (*y*), for particular values of the independent variable (*x*). Regression shows how *y* changes for each additional increment of *x* and predicts the likely value of *y* for a given value of *x*. The closer *r* is to 1, the less scatter there is and therefore the better the fit between the line of best fit and the data. If *r* is low, scatter will be greater and the regression equation will provide a less accurate representation of the relationship between two variables. Correlation is concerned with the degree of relationship between variables, and regression with making predictions. The r^2 value is often used as an indication of how well the model implied by the regression equation fits the data. r^2 reflects the proportion of the variation in *y* explained by *x*. if r^2 =0.80, the model is providing an explanation of 80% of the variance in *y*, i.e. r^2 =0.80 means that 80% of variance in the dependent variable is explained by the independent variable. Regression gives information about t value, analysis of variance which provides an *F* test for the equation and a p value.

Appendix 5

The Findings and Data Analysis

Appendix 5A - Strategy types and the capacity of the manufactured moulds

Table 5A1 - Cross-tabulation, strategy types and the capacity of the manufactured mould; the evolution within capacity category, 1980-97

Up to 1999 mould capacity, 1980-97

Strategy Types	Up to 1999, 1980-86	Up to 1999, 1987-92	Up to 1999, 1993-95	Up to 1999, 1996	Up to 1999, 1997
Defender	23.8 %	24.0 %	14.3 %	16.7 %	17.6 %
Prospector	9.1 %	21.4 %	7.1 %	12.5 %	14.3 %
Analyser	53.8 %	33.3 %	25.0 %	15.4 %	13.8 %
Reactor	50.0 %	33.3 %			
Total	30.6 %	26.7 %	15.9 %	14.3 %	14.5 %

2000-4999 mould capacity, 1980-97

Strategy Types	2000-4999, 1980-86	2000-4999, 1987-92	2000-4999, 1993-95	2000-4999, 1996	2000-4999, 1997
Defender	42.9 %	44.0 %	47.6 %	44.4 %	41.2 %
Prospector	36.4 %	28.6 %	35.7 %	18.8 %	21.4 %
Analyser	23.1 %	38.9 %	20.8 %	23.1 %	20.7 %
Reactor	50.0 %	66.7 %	25.0 %	66.7 %	50.0 %
Total	36.7 %	40.0 %	33.3 %	30.2 %	27.4 %

5000-9999 mould capacity, 1980-97

Strategy Types	5000-9999, 1980-86	5000-9999, 1987-92	5000-9999, 1993-95	5000-9999, 1996	5000-9999, 1997
Defender	23.8%	20.0%	23.8%	27.8%	29.4%
Prospector	36.4%	35.7%	7.1%	25.0%	14.3%
Analyser		11.1%	37.5%	30.8%	27.6%
Reactor			50.0%	33.3%	50.0%
Total	18.4%	20.0%	27.0%	28.6%	25.8%

Over 10,000 mould capacity, 1980-97

Strategy Types	Over 10,000 1980-86	Over 10.000, 1987-92	Over 10.000, 1993-95	Over 10.000, 1996	Over 10.000, 1997
Defender	9.5%	12.0%	14.3%	11.1%	11.8%
Prospector	18.2%	14.3%	50.0%	43.8%	50.0%
Analyser	23.1%	16.7%	16.7%	30.8%	37.9%
Reactor			25.0%		
Total	14.3%	13.3%	23.8%	27.0%	32.3%

Table 5A2 - Cross-tabulation, the capacity of the manufactured mould of each strategy type across the timescales, 1980-97

Defenders - Mould Capacity

Strategy Types	Up to 1999	2000-4999	5000-9999	Over 10,000
Defender 86	23.8%	42.9%	23.8%	9.5%
Defender 92	24.0%	44.0%	20.0%	12.0%
Defender 95	14.3%	47.6%	23.8%	14.3%
Defender 96	16.7%	44.4%	27.8%	11.1%
Defender 97	17.6%	41.2%	29.4%	11.8%

Prospectors - Mould Capacity

Strategy Types	Up to 1999	2000-4999	5000-9999	Over 10,000
Prospector 86	9.1%	36.4%	36.4%	18.2%
Prospector 92	21.4%	28.6%	35.7%	14.3%
Prospector 95	7.1%	35.7%	7.1%	50.0%
Prospector 96	12.5%	18.8%	25.0%	43.8%
Prospector 97	14.3%	21.4%	14.3%	50.0%

Analysers - Mould Capacity

Strategy Types	Up to 1999	2000-4999	5000-9999	Over 10,000
Analyser 86	53.8%	23.1%		23.1%
Analyser 92	33.3%	38.9%	11.1%	16.7%
Analyser 95	25.0%	20.8%	37.5%	16.7%
Analyser 96	15.4%	23.1%	30.8%	30.8%
Analyser 97	13.8%	20.7%	27.6%	37.9%

Reactors - Mould Capacity

Strategy Types	Up to 1999	2000-4999	5000-9999	Over 10,000
Reactor 86	50.0%	50.0%		
Reactor 92	33.3%	66.7%		
Reactor 95		25.0%	50.0%	25.0%
Reactor 96		66.7%	33.3%	
Reactor 97		50.0%	50.0%	

Figure 5A2 - Cross-tabulation, the capacity of the manufactured mould of each strategy type across the timescales, 1980-97

Figure 5A2A - mould capacity, Defenders, 1980-97

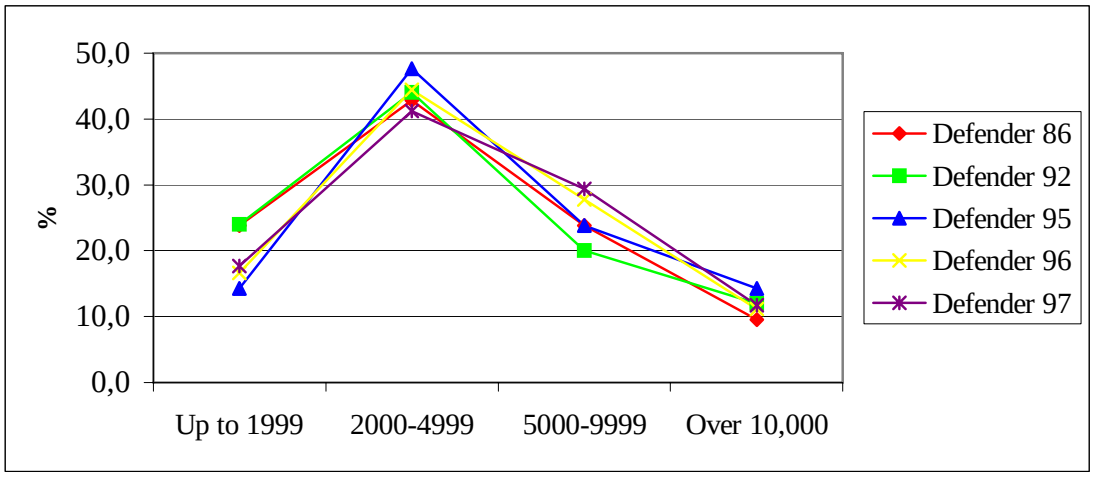


Figure 5A2B - mould capacity, Prospectors, 1980-97

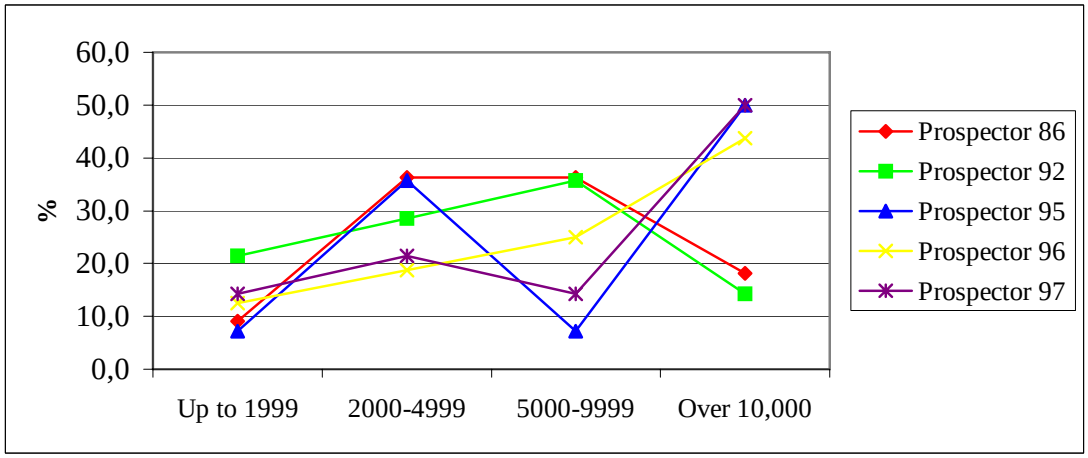
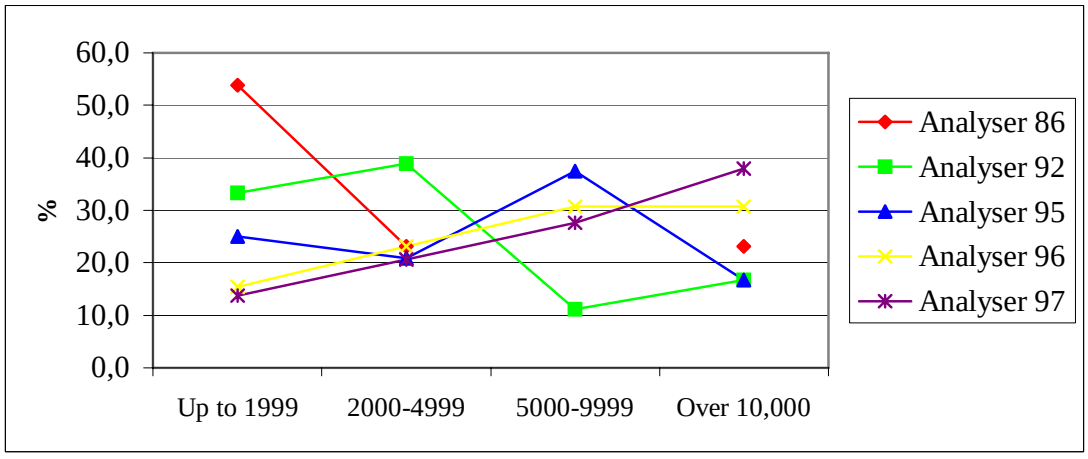
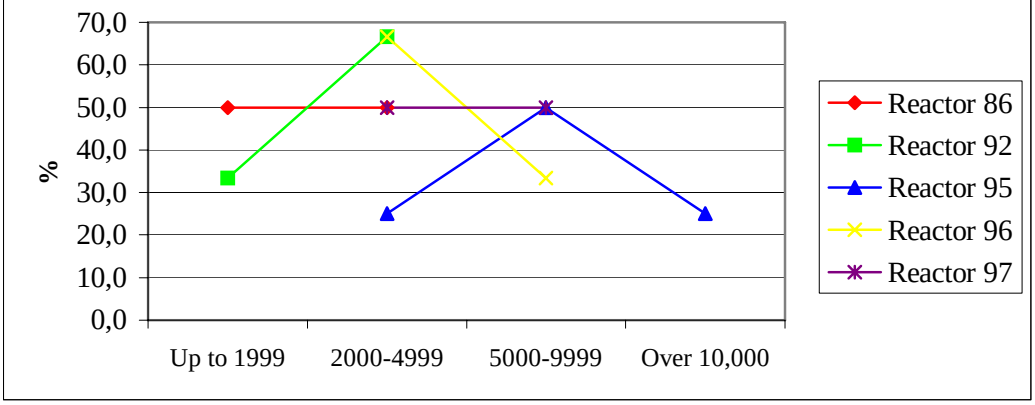


Figure 5A2C - mould capacity, Analysers, 1980-97



Cont. Figure 5A2 - Cross-tabulation, the capacity of the manufactured mould of each strategy type across the timescales, 1980-97

Figure 5A2D - mould capacity, Reactors, 1980-97



Appendix 5B - Strategy types and the complexity of the manufactured moulds

Table 5B1 - Cross-tabulation, strategy types and the complexity of the manufactured mould; the evolution within complexity category 1980-97

Low mould complexity, 1980-97

Strategy Types	Low 86	Low 92	Low 95	Low 96	Low 97
Defender	61.9 %	40.0 %	23.8 %	27.8 %	35.3 %
Prospector	63.6 %	35.7 %	14.3 %	18.8 %	14.3 %
Analyser	69.2 %	38.9 %	37.5 %	23.1 %	20.7 %
Reactor	75.0 %	66.7 %	75.0 %	66.7 %	66.7%
Total	65.3 %	40.0 %	30.2 %	25.4 %	25.4 %

Medium mould complexity, 1980-97

Strategy Types	Medium 86	Medium 92	Medium 95	Medium 96	Medium 97
Defender	38.1 %	48.0 %	52.4 %	44.4 %	41.2 %
Prospector	9.1 %	28.6 %	57.1 %	43.8 %	50.0 %
Analyser	7.7 %	27.8 %	33.3 %	53.8 %	51.7 %
Reactor		33.3 %	25.0 %	33.3 %	33.3 %
Total	20.4 %	36.7 %	44.4 %	47.6 %	47.6 %

High mould complexity, 1980-97

Strategy Types	High 86	High 92	High 95	High 96	High 97
Defender		12.0 %	23.8 %	27.8 %	23.5 %
Prospector	27.3 %	35.7 %	28.6 %	37.5 %	35.7 %
Analyser	23.1 %	33.3 %	29.2%	23.1 %	27.6 %
Reactor	25.0 %				
Total	14.3 %	23.3 %	25.4 %	27.0 %	27.0 %

Table 5B2 - Cross-tabulation, the complexity of the manufactured mould of each strategy type across the timescales, 1980-97

Defenders - Mould Complexity

Strategy Types	Low	Medium	High
Defender 86	61.9 %	38.1%	0.0%
Defender 92	40.0%	48.0%	12.0%
Defender 95	23.8%	52.4%	23.8%
Defender 96	27.8%	44.4%	27.8%
Defender 97	35.3%	41.2%	23.5%

Prospectors - Mould Complexity

Strategy Types	Low	Medium	High
Prospector 86	63.6%	9.1%	27.3%
Prospector 92	35.7%	28.6%	35.7%
Prospector 95	14.3%	57.1%	28.6%
Prospector 96	18.8%	43.8%	37.5%
Prospector 97	14.3%	50.0%	35.7%

Analysers - Mould Complexity

Strategy Types	Low	Medium	High
Analyser 86	69.2%	7.7%	23.1%
Analyser 92	38.9%	27.8%	33.3%
Analyser 95	37.5%	33.3	29.2%
Analyser 96	23.1%	53.8%	23.1%
Analyser 97	20.7%	51.7%	27.6%

Reactors - Mould Complexity

Strategy Types	Low	Medium	High
Reactor 86	75.0%	0.0%	25.0%
Reactor 92	66.7%	33.3%	0.0%
Reactor 95	75.0%	25.0%	0.0%
Reactor 96	66.7%	33.3%	0.0%
Reactor 97	66.7%	33.3%	0.0%

Figure 5B2- Cross-tabulation, the complexity of the manufactured mould of each strategy type across the timescales, 1980-97

Figure 5B2A - mould complexity, Defenders, 1980-97

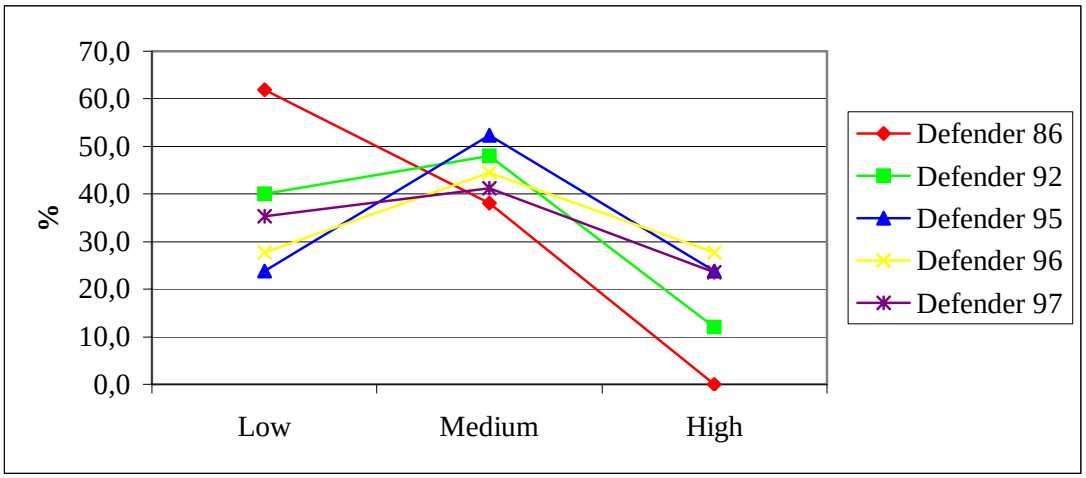


Figure 5B2B - mould complexity, Prospectors, 1980-97

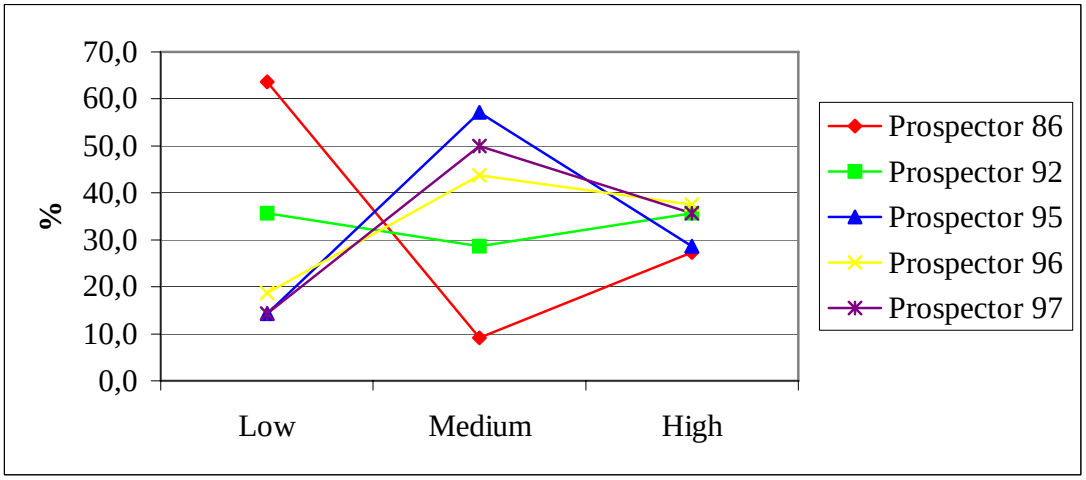
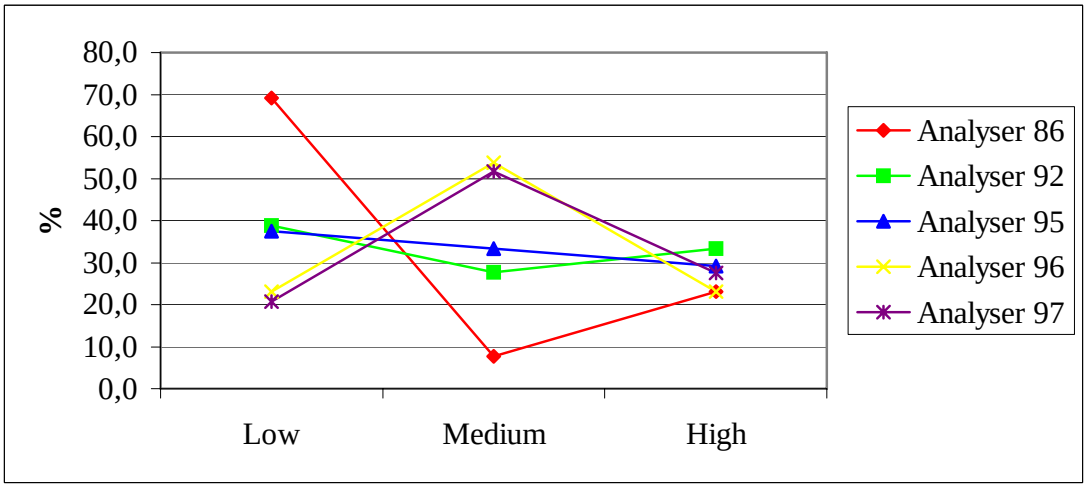
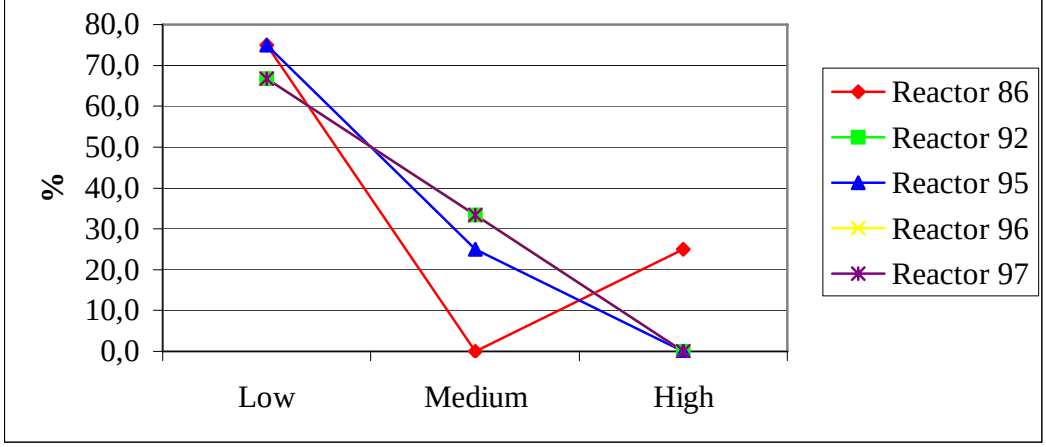


Figure 5B2C - mould complexity, Analysers, 1980-97



Cont. Figure 5B2 - Cross-tabulation, the complexity of the manufactured mould of each strategy type across the timescales, 1980-97

Figure 5B2D- mould complexity, Reactors, 1980-97



Appendix 5C - Strategy types and the markets to which they currently sell (1996)

Table 5C1 - Strategy types, and the markets to which they currently sell, total sales, 1996

Report
Sum

Strategy Types 96	SALPOR96	SALEUK96	SALEGE96	SALEUS96	SALEFR96	SALEIS96	SALESP96	SALESW96	SALEBR96	SALEHO96	SALEOT96	Total
Defender	928,932	431,556	842,207	1,498,049	304,276	35,065	74,626	136,100	289,189	225,219	528,128	5,293,344
Prospector	1,665,987	820,169	1,353,866	2,089,969	1,658,265	182,035	306,224	2,391,523	859,504	990,618	851,359	13,169,520
Analyser	1,532,439	673,721	1,482,862	1,447,123	1,283,042	619,616	815,875	313,596	1,120,132	71,281	712,281	10,071,966
Reactor	160,052	58,565	0	205,213	0	140,528	0	0	0	0	21,294	585,652
Total	4,287,410	1,984,011	3,678,934	5,240,354	3,245,582	977,244	1,196,725	2,841,218	2,268,825	1,287,118	2,113,061	29,120,482

Appendix 5D - Strategy types and the markets in which have occurred the most significant variation of total sales

Table 5D1 - Trends in geographical markets: strategy types and the markets in which occurred the most significant variation of total sales, 1980-1996

1980-86

Report
Sum

Strategy Types 86	American 86	German 86	Brazilian 86	British 86	French 86	Dutch 86	Israelite 86	Portuguese 86	Spanish 86	Belgium 86	Swedish 86	Other markets 86
Defender	334.894	7.624	0	21.049	9.094	19.693	0	0	0	0	0	21.606
Prospector	712.424	131.155	37.762	152.216	21.461	21.461	0	271.425	0	0	0	20.692
Analyser	708.946	30.841	49.940	12.956	0	0	80.912	4.939	0	0	0	29.700
Reactor	9.104	8.774	0	0	0	0	0	0	25.344	0	0	0
Total	1.765.369	178.395	87.702	186.221	30.555	41.154	80.912	276.365	25.344	0	0	71.998

1987-92

Report
Sum

Strategy Types 92	American 92	German 92	Brazilian 92	British 92	French 92	Dutch 92	Israelite 92	Portuguese 92	Spanish 92	Belgium 92	Swedish 92	Other markets 92
Defender	867.150	346.764	5.426	74.307	140.176	77.916	0	96.000	20.453	4.800	0	31.541
Prospector	946.416	442.093	211.733	77.068	122.349	70.841	57.947	367.615	0	0	56.247	83.479
Analyser	1.232.339	260.050	64.553	13.317	73.093	0	275.380	13.273	72.243	0	0	136.595
Reactor	34.664	28.012	0	11.205	16.807	0	0	22.410	0	0	0	0
Total	3.080.569	1.076.919	281.712	175.897	352.425	148.757	333.327	499.298	92.696	4.800	56.247	251.616

1993-95

Report
Sum

Strategy Types 95	American 95	German 95	Brazilian 95	British 95	French 95	Dutch 95	Israelite 95	Portuguese 95	Spanish 95	Belgium 95	Swedish 95	Other markets 95
Defender	840.666	453.962	225.537	137.832	504.369	96.127	0	7.426	56.057	0	0	28.615
Prospector	913.761	417.069	226.800	59.577	344.169	230.012	49.648	433.740	0	0	185.297	50.583
Analyser	898.287	859.758	550.105	113.227	99.668	100.800	389.410	112.000	162.635	43.200	0	236.177
Reactor	91.756	41.869	49.257	14.777	78.812	0	0	102.848	29.554	0	0	0
Total	2.744.470	1.772.658	1.051.699	325.413	1.027.018	426.939	439.058	656.014	248.247	43.200	185.297	315.375

1996

Report
Sum

Strategy Types 96	American 96	German 96	Brazilian 96	British 96	French 96	Dutch 96	Israelite 96	Portuguese 96	Spanish 96	Belgium 96	Swedish 96	Other markets 96
Defender	1.238.616	556.868	289.189	225.768	226.853	126.990	0	0	66.736	32.358	62.360	75.000
Prospector	859.969	660.508	674.474	87.920	443.745	726.743	0	486.340	132.000	42.300	528.646	154.013
Analyser	938.209	825.650	1.105.474	226.938	268.317	30.206	546.670	89.884	286.814	0	0	330.119
Reactor	21.294	0	0	10.998	0	0	87.980	149.055	0	0	0	0
Total	3.058.088	2.043.026	2.069.136	551.624	938.915	883.938	634.650	725.278	485.550	74.658	591.006	559.132

Table 5D2 - Strategy types and the markets in which have occurred the most significant variation of total sales; the evolution within each market

Report
Sum

The American market, 1980-96

Strategy Types	American 86	American 92	American 95	American 96
Defender	334.894	867.150	840.666	1.238.616
Prospector	712.424	946.416	913.761	859.969
Analyser	708.946	1.232.339	898.287	938.209
Reactor	9.104	34.664	91.756	21.294

the German market, 1980-96

Strategy Types	German 86	German 92	German 95	German 96
Defender	7.624	346.764	453.962	556.868
Prospector	131.155	442.093	417.069	660.508
Analyser	30.841	260.050	859.758	825.650
Reactor	8.774	28.012	41.869	0

the Brazilian market, 1980-96

Strategy Types	Brazilian 86	Brazilian 92	Brazilian 95	Brazilian 96
Defender	0	5.426	225.537	289.189
Prospector	37.762	211.733	226.800	674.474
Analyser	49.940	64.553	550.105	1.105.474
Reactor	0	0	49.257	0

the British market, 1980-96

Strategy Types	British 86	British 92	British 95	British 96
Defender	21.049	74.307	137.832	225.768
Prospector	152.216	77.068	59.577	87.920
Analyser	12.956	13.317	113.227	226.938
Reactor	0	11.205	14.777	10.998

the French market, 1980-96

Strategy Types	French 86	French 92	French 95	French 96
Defender	9.094	140.176	504.369	226.853
Prospector	21.461	122.349	344.169	443.745
Analyser	0	73.093	99.668	268.317
Reactor	0	16.807	78.812	0

the Dutch market, 1980-96

Strategy Types	Dutch 86	Dutch 92	Dutch 95	Dutch 96
Defender	19.693	77.916	96.127	126.990
Prospector	21.461	70.841	230.012	726.743
Analyser	0	0	100.800	30.206
Reactor	0	0	0	0

Table 5D2 Cont. - Strategy types and the markets in which have occurred the most significant variation of total sales; the evolution within each market

Report
Sum

the Israelite market, 1980-96

Strategy Types	Israelite 86	Israelite 92	Israelite 95	Israelite 96
Defender	0	0	0	0
Prospector	0	57.947	49.648	0
Analyser	80.912	275.380	389.410	546.670
Reactor	0	0	0	87.980

the Portuguese market, 1980-96

Strategy Types	Portuguese 86	Portuguese 92	Portuguese 95	Portuguese 96
Defender	0	96.000	7.426	0
Prospector	271.425	367.615	433.740	486.340
Analyser	4.939	13.273	112.000	89.884
Reactor	0	22.410	102.848	149.055

the Spanish market, 1980-96

Strategy Types	Spanish 86	Spanish 92	Spanish 95	Spanish 96
Defender	0	20.453	56.057	66.736
Prospector	0	0	0	132.000
Analyser	0	72.243	162.635	286.814
Reactor	25.344	0	29.554	0

the Belgium market, 1980-96

Strategy Types	Belgium 86	Belgium 92	Belgium 95	Belgium 96
Defender	0	4.800	0	32.358
Prospector	0	0	0	42.300
Analyser	0	0	43.200	0
Reactor	0	0	0	0

the Swedish market, 1980-96

Strategy Types	Swedish 86	Swedish 92	Swedish 95	Swedish 96
Defender	0	0	0	62.360
Prospector	0	56.247	185.297	528.646
Analyser	0	0	0	0
Reactor	0	0	0	0

the “other” markets, 1980-96

Strategy Types	Other markets 86	Other markets 92	Other markets 95	Other markets 96
Defender	21.606	31.541	28.615	75.000
Prospector	20.692	83.479	50.583	154.013
Analyser	29.700	136.595	236.177	330.119
Reactor	0	0	0	0

Figure 5D2 - Strategy types and the markets in which have occurred the most significant variation of total sales; the evolution within each market, 1980-96

Figure 5D2A - the American market, 1980-96

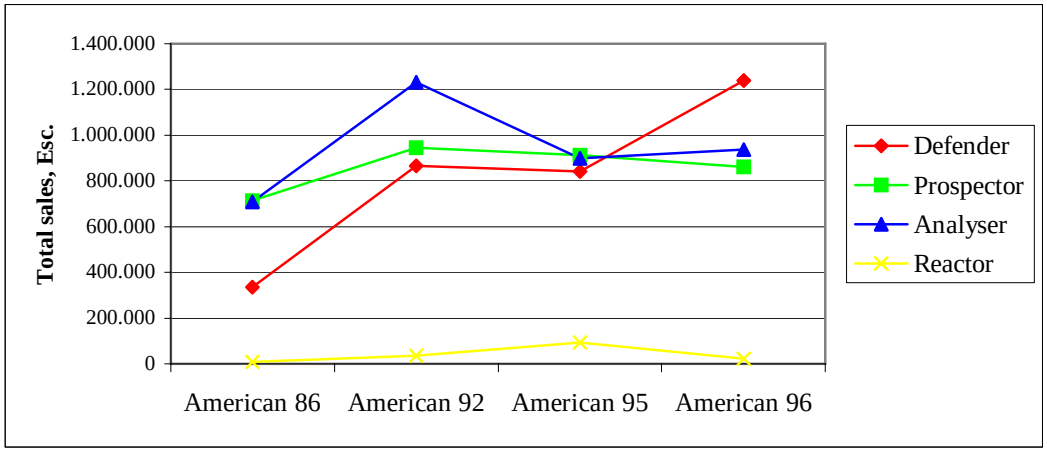


Figure 5D2B - the German market, 1980-96

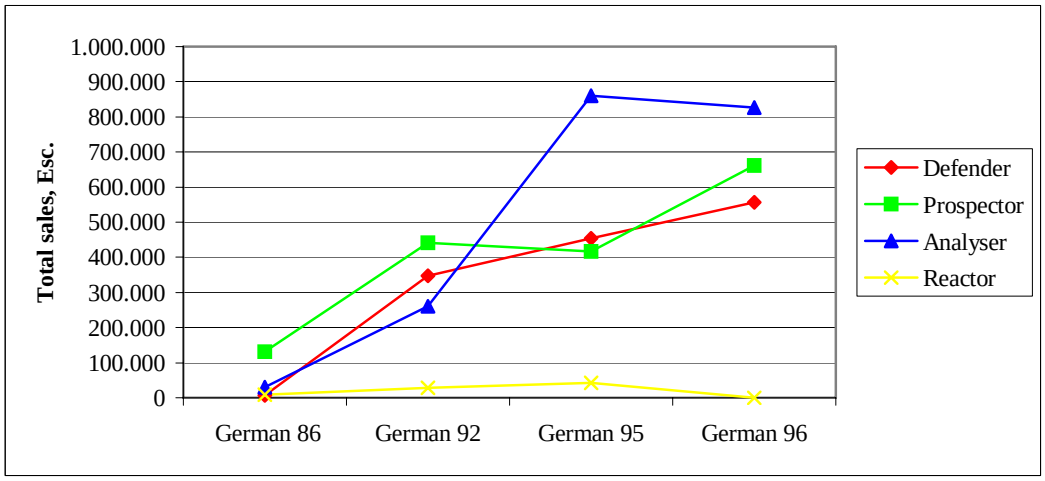


Figure 5D2C - the Brazilian market, 1980-96

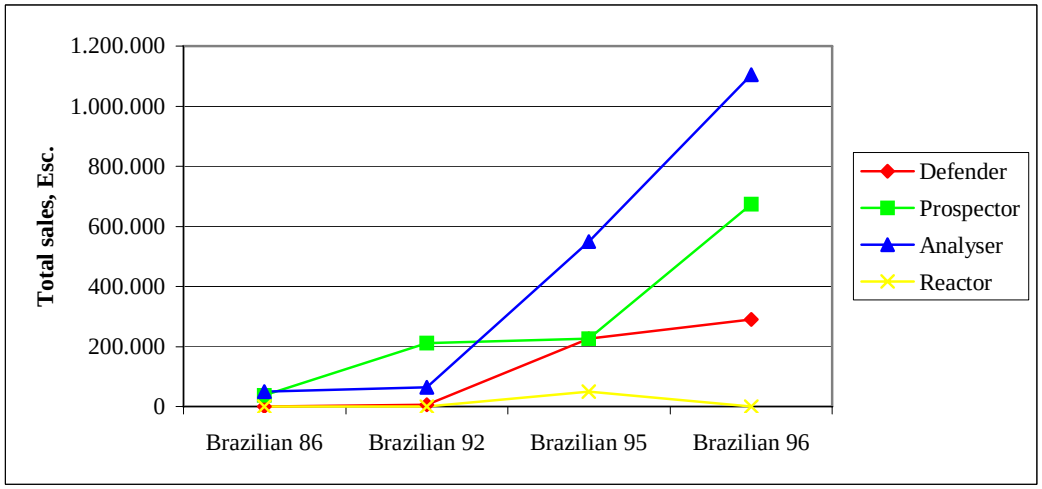


Figure 5D2 Cont. - Strategy types and the markets in which have occurred the most significant variation of total sales; the evolution within each market, 1980-96

Figure 5D2D - the British market, 1980-96

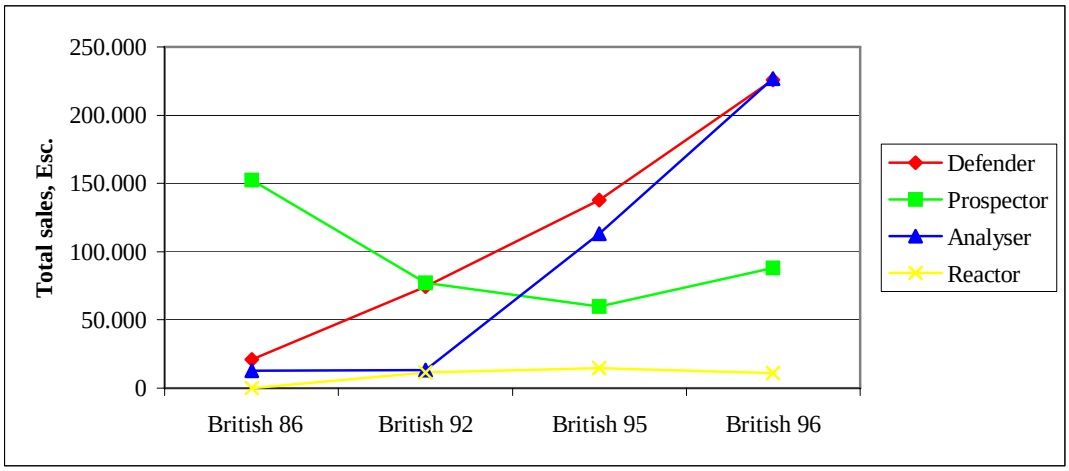


Figure 5D2E - the French market, 1980-96

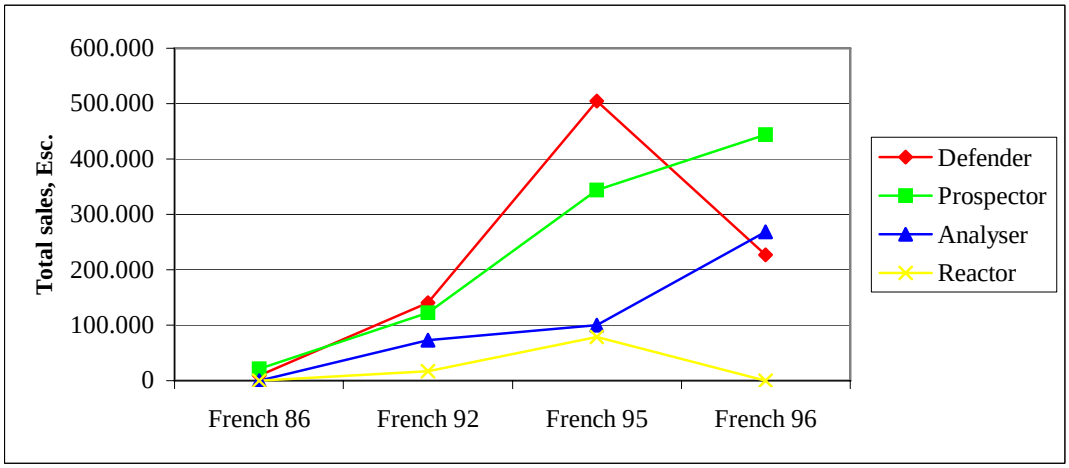


Figure 5D2F - the Dutch market, 1980-96

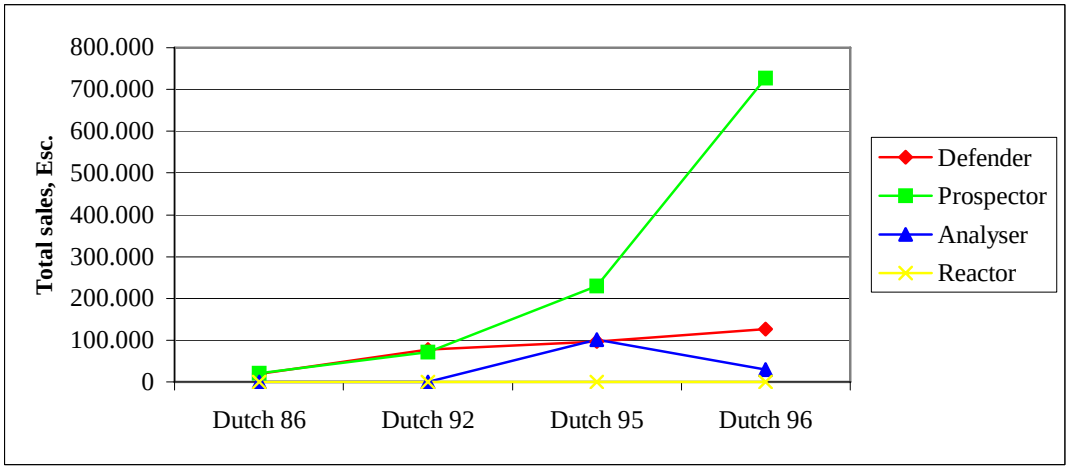


Figure 5D2 Cont. - Strategy types and the markets in which have occurred the most significant variation of total sales; the evolution within each market, 1980-96

Figure 5D2G - the Israelite market, 1980-96

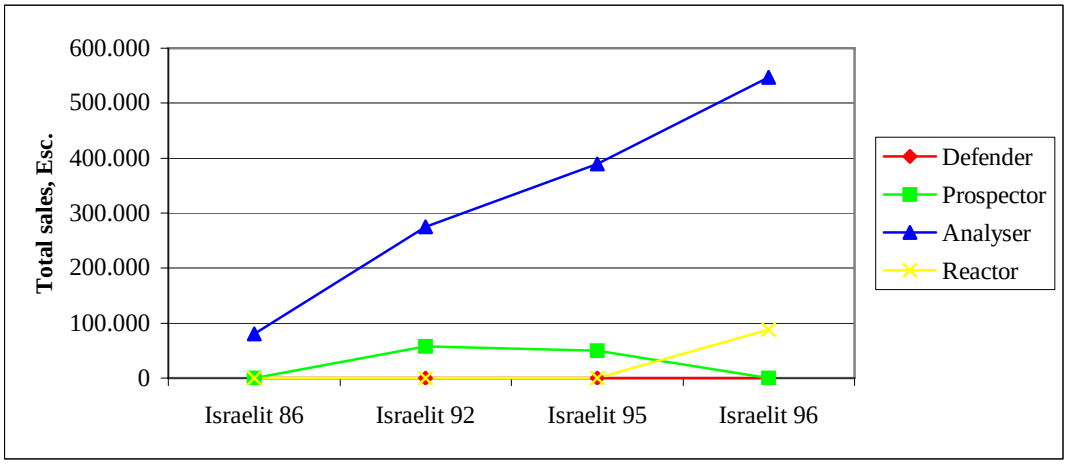


Figure 5D2H - the Portuguese market, 1980-96

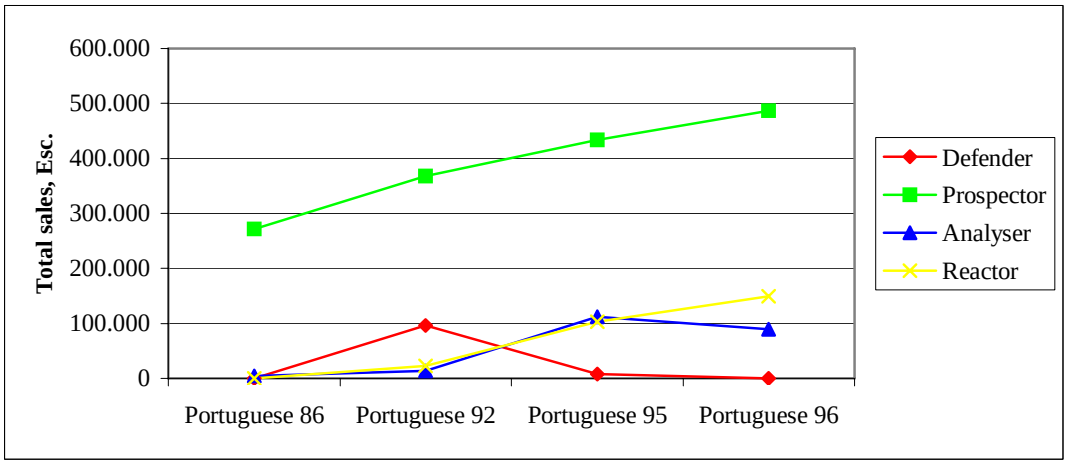


Figure 5D2I - the Spanish market, 1980-96

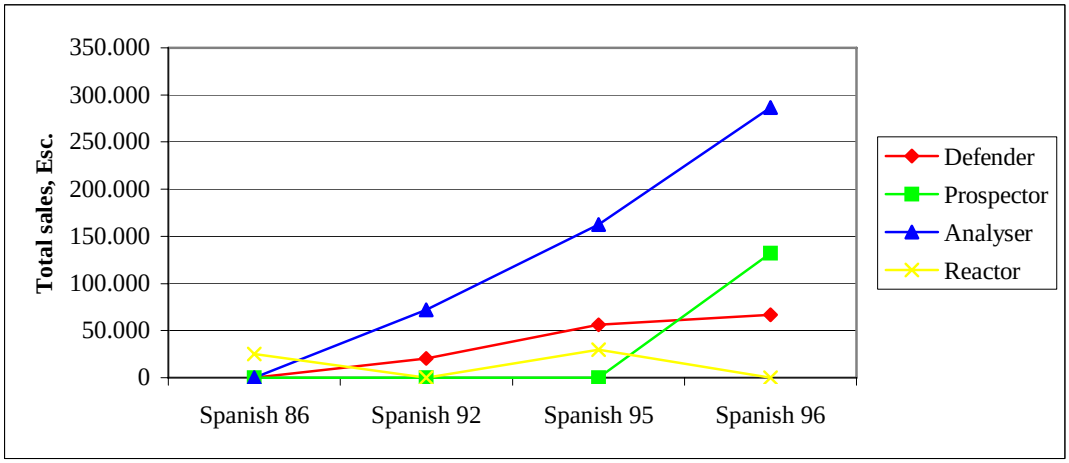


Figure 5D2 Cont. - Strategy types and the markets in which have occurred the most significant variation of total sales; the evolution within each market, 1980-96

Figure 5D2J - the Belgium market, 1980-96

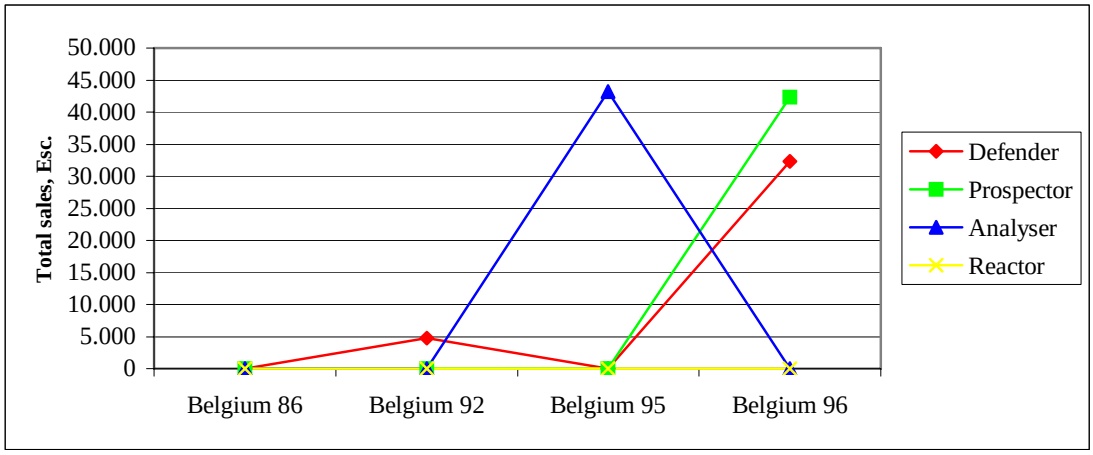


Figure 5D2K - the Swedish market, 1980-96

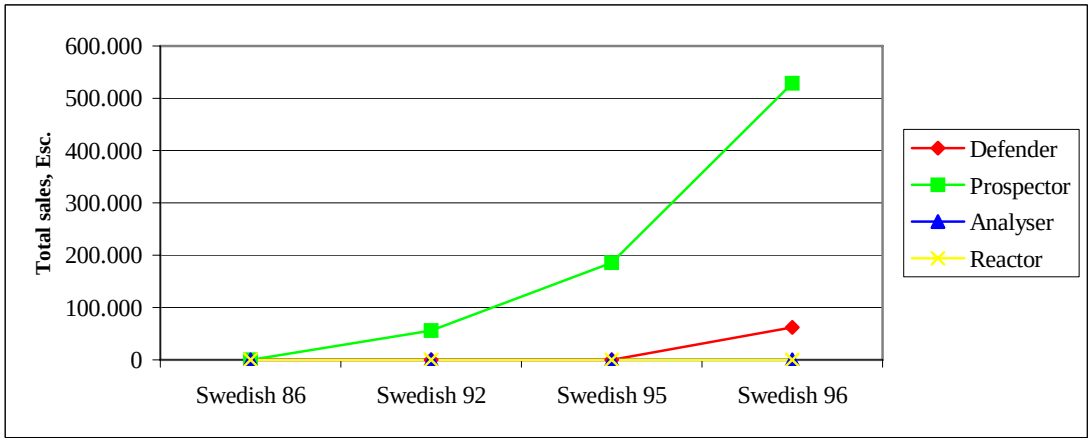


Figure 5D2L - the "other" markets, 1980-96

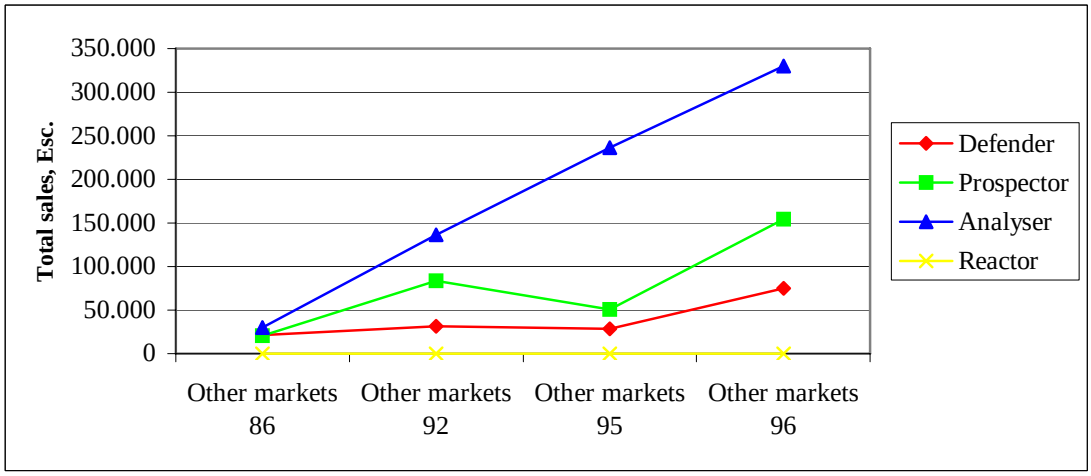


Table 5D3 - Cross-tabulation, the markets in which have occurred the most significant variation of total sales, 1997 (a forecast)

Strategy Types 97 * changing the American market 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	7 58.3%	2 16.7%	3 25.0%	12 100.0%
	Prospector	Count % within Strategy Types 97	7 77.8%	1 11,1%	1 18,8%	9 100,0%
	Analyser	Count % within Strategy Types 97	12 70.6%	2 11.8%	3 17.6%	17 100.0%
	Reactor	Count % within Strategy Types 97		1 100.0%		1 100.0%
Total		Count % within Strategy Types 97	26 66.7%	6 15.4%	7 17.9%	39 100.0%

Strategy Types 97 * changing the German market 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	3 60.0%	2 40.0%		5 100.0%
	Prospector	Count % within Strategy Types 97	3 75.0%	1 25.0%		4 6.3%
	Analyser	Count % within Strategy Types 97	5 50.0%	3 30.0%	2 20.0%	10 100.0%
Total		Count % within Strategy Types 97	11 57.9%	6 31.6%	2 10.5%	19 100.0%

Strategy Types 97 * changing the Brazilian market 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	4 66.7%	1 16.7%	1 16.7%	6 100.0%
	Prospector	Count % within Strategy Types 97	3 100.0%			3 100.0%
	Analyser	Count % within Strategy Types 97	12 85.7%	2 14.3%		14 100.0%
Total		Count % within Strategy Types 97	19 82.6%	3 13.0%	1 4.3%	23 100.0%

Table 5D4 - The markets in which have occurred the most significant variation of total sales of each strategy type across the timescales, 1980-96

Report
Sum

Defender 1980-96

Strategy Types	American	German	Brazilian	British	French	Dutch	Israelite	Portuguese	Spanish	Belgium	Swedish	Other Markets
Defender 86	334.894	7.624	0	21.049	9.094	19.693	0	0	0	0	0	21.606
Defender 92	867.150	346.764	5.426	74.307	140.176	77.916	0	96.000	20.453	4.800	0	31.541
Defender 95	840.666	453.962	225.537	137.832	504.369	96.127	0	7.426	56.057	0	0	28.615
Defender 96	1.238.616	556.868	289.189	225.768	226.853	126.990	0	0	66.736	32.358	62.360	75.000

Prospector 1980-96

Strategy Types	American	German	Brazilian	British	French	Dutch	Israelite	Portuguese	Spanish	Belgium	Swedish	Other markets
Prospector 86	712.424	131.155	37.762	152.216	21.461	21.461	0	271.425	0	0	0	20.692
Prospector 92	946.416	442.093	211.733	77.068	122.349	70.841	57.947	367.615	0	0	56.247	83.479
Prospector 95	913.761	417.069	226.800	59.577	344.169	230.012	49.648	433.740	0	0	185.297	50.583
Prospector 96	859.969	660.508	674.474	87.920	443.745	726.743	0	486.340	132.000	42.300	528.646	154.013

Analyser 1980-96

Strategy Types	American	German	Brazilian	British	French	Dutch	Israelite	Portuguese	Spanish	Belgium	Swedish	Other markets
Analyser 86	708.946	30.841	49.940	12.956	0	0	80.912	4.939	0	0	0	29.700
Analyser 92	1.232.339	260.050	64.553	13.317	73.093	0	275.380	13.273	72.243	0	0	136.595
Analyser 95	898.287	859.758	550.105	113.227	99.668	100.800	389.410	112.000	162.635	43.200	0	236.177
Analyser 96	938.209	825.650	1.105.474	226.938	268.317	30.206	546.670	89.884	286.814	0	0	330.119

Reactor 1980-96

Strategy Types	American	German	Brazilian	British	French	Dutch	Israelite	Portuguese	Spanish	Belgium	Swedish	Other markets
Reactor 86	9.104	8.774	0	0	0	0	0	0	25.344	0	0	0
Reactor 92	34.664	28.012	0	11.205	16.807	0	0	22.410	0	0	0	0
Reactor 95	91.756	41.869	49.257	14.777	78.812	0	0	102.848	29.554	0	0	0
Reactor 96	21.294	0	0	10.998	0	0	87.980	149.055	0	0	0	0

Figure 5D4 - The markets in which occurred the most significant variation of total sales of each strategy type across the timescales, 1980-96

Figure 5D4A - markets in which occurred the most significant variation of total sales, Defenders, 1980-96

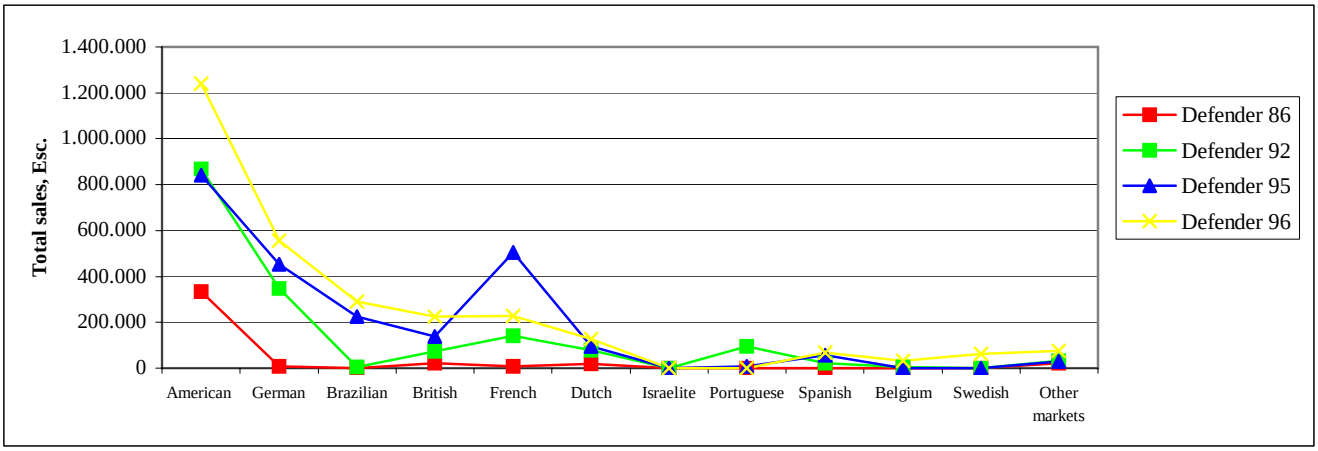


Figure 5D4B - markets in which occurred the most significant variation of total sales, Prospectors, 1980-96

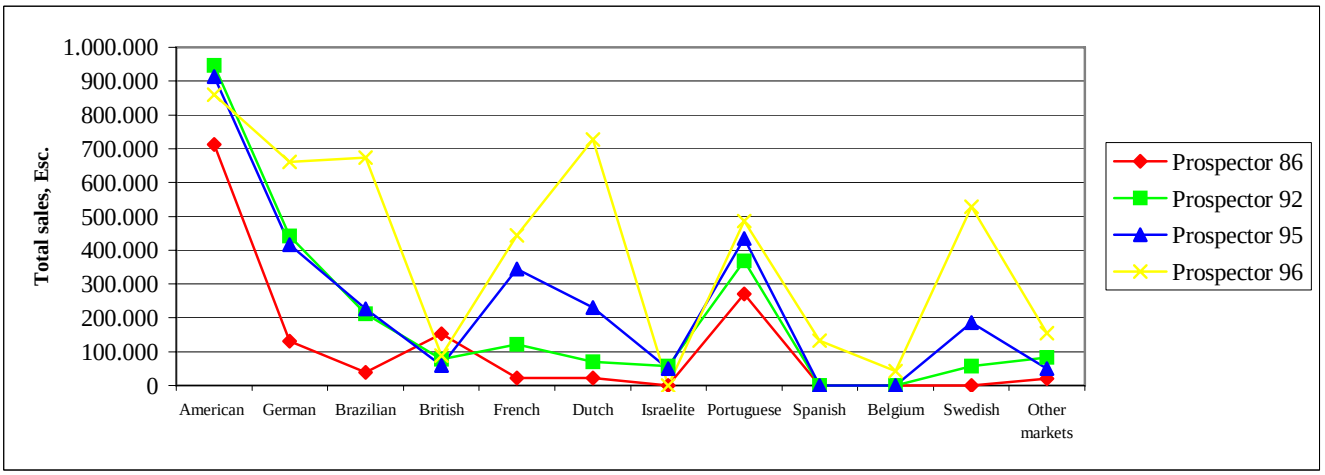


Figure 5D4C - markets in which occurred the most significant variation of total sales, Analysers, 1980-96

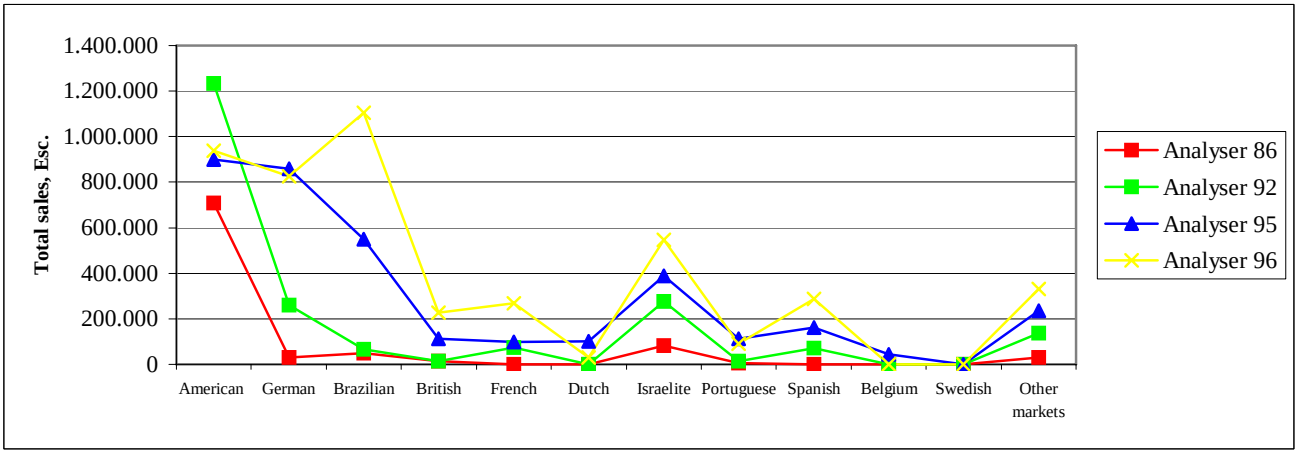
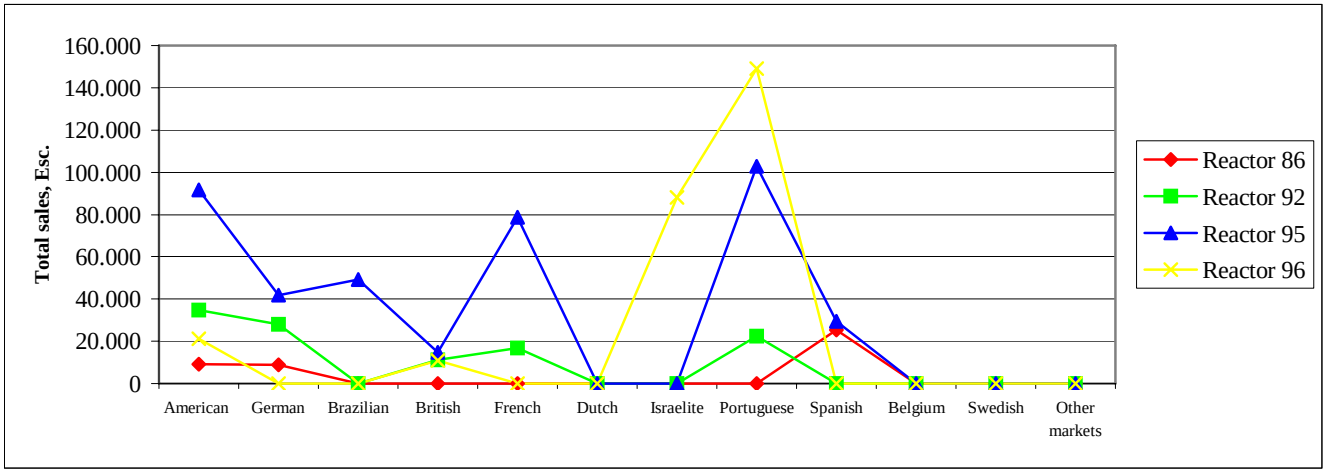


Figure 5D4 Cont. - The markets in which occurred the most significant variation of total sales of each strategy type across the timescales, 1980-96

Figure 5D4D - markets in which occurred the most significant variation of total sales, Reactors, 1980-96



Appendix 5E - Strategy types and the client industries

Table 5E1 - Strategy types and the client industries, 1980-1996

1980-86

Report
Sum

Strategy Types 86	AUTO86	ELECTR86	DAPPLI86	TOYS86	DUTILI86	OTHERS86	Total
Defender	186.154	136.879	332.511	156.897	106.962	165.066	1.084.468
Prospector	132.223	326.198	329.947	478.061	241.047	96.432	1.603.909
Analyser	177.280	307.401	169.564	340.005	240.311	109.100	1.343.660
Reactor	2.194	7.262	18.309	31.528	26.459	20.275	106.027
Total	497.850	777.741	850.332	1.006.491	614.779	390.873	4.138.065

1987-92

Report
Sum

Strategy Types 92	AUTO92	ELECTR92	DAPPLI92	TOYS92	DUTILI92	OTHERS92	Total
Defender	616.847	599.232	1.093.266	337.954	568.497	495.671	3.711.467
Prospector	752.662	1.115.002	1.577.288	621.250	287.184	412.425	4.765.812
Analyser	964.845	894.660	760.481	501.524	573.229	267.577	3.962.315
Reactor		28.012	78.434	36.725	21.342		164.512
Total	2.334.354	2.636.907	3.509.469	1.497.453	1.450.251	1.175.672	12.604.106

1993-95

Report
Sum

Strategy Types 95	AUTO95	ELECTR95	DAPPLI95	TOYS95	DUTILI95	OTHERS95	Total
Defender	870.635	882.124	1.157.731	303.413	857.370	673.491	4.744.764
Prospector	2.560.781	986.251	2.171.503	431.679	647.496	1.565.115	8.362.825
Analyser	2.725.930	1.582.042	1.884.801	484.728	1.131.823	498.671	8.307.994
Reactor	144.392	45.878	52.961	56.064	31.435	74.234	404.963
Total	6.301.738	3.496.294	5.266.996	1.275.883	2.668.124	2.811.510	21.820.546

1996

Report
Sum

Strategy Types 96	AUTO96	ELECTR96	DAPPLI96	TOYS96	DUTILI96	OTHERS96	Total
Defender	962.956	1.057.765	1.037.347	327.875	1.369.592	537.809	5.293.344
Prospector	5.103.156	1.647.156	2.780.683	147.921	1.177.805	2.312.800	13.169.520
Analyser	4.527.042	1.212.440	1.860.777	478.211	1.084.876	908.621	10.071.966
Reactor	21.294	21.294	21.294	78.823	217.211	225.738	585.652
Total	10.614.447	3.938.654	5.700.101	1.032.828	3.849.485	3.984.967	29.120.482

Table 5E2 - Strategy types and client industries; the evolution within each client industries, 1980-96

the Automobile industry, 1980-96

Report
Sum

Strategy Types	AUTO86	AUTO92	AUTO95	AUTO96
Defender	186.154	616.847	870.635	962.956
Prospector	132.223	752.662	2.560.781	5.103.156
Analyser	177.280	964.845	2.725.930	4.527.042
Reactor	2.194	0	144.392	21.294

the Electric/Electronic industry, 1980-96

Strategy Types	ELECTR86	ELECTR92	ELECTR95	ELECTR96
Defender	136.879	599.232	882.124	1.057.765
Prospector	326.198	1.115.002	986.251	1.647.156
Analyser	307.401	894.660	1.582.042	1.212.440
Reactor	7.262	28.012	45.878	21.294

the Domestic Appliances industry, 1980-96

Strategy Types	DAPPLI86	DAPPLI92	DAPPLI95	DAPPLI96
Defender	332.511	1.093.266	1.157.731	1.037.347
Prospector	329.947	1.577.288	2.171.503	2.780.683
Analyser	169.564	760.481	1.884.801	1.860.777
Reactor	18.309	78.434	52.961	21.294

the Toy industry, 1980-96

Strategy Types	TOYS86	TOYS92	TOYS95	TOYS96
Defender	156.897	337.954	303.413	327.875
Prospector	478.061	621.250	431.679	147.921
Analyser	340.005	501.524	484.728	478.211
Reactor	31.528	36.725	56.064	78.823

the Domestic Utilities industry, 1980-96

Strategy Types	DUTILI86	DUTILI92	DUTILI95	DUTILI96
Defender	106.962	568.497	857.370	1.369.592
Prospector	241.047	287.184	647.496	1.177.805
Analyser	240.311	573.229	1.131.823	1.084.876
Reactor	26.459	21.342	31.435	217.211

the “Other” industry, 1980-96

Strategy Types	OTHERS86	OTHERS92	OTHERS95	OTHERS96
Defender	165.066	495.671	673.491	537.809
Prospector	96.432	412.425	1.565.115	2.312.800
Analyser	109.100	267.577	498.671	908.621
Reactor	20.275	0	74.234	225.738

Figure 5E2 - Strategy types and client industries; the evolution within each client industries, 1980-96

Figure 5E2A - the automobile industry, 1980-96

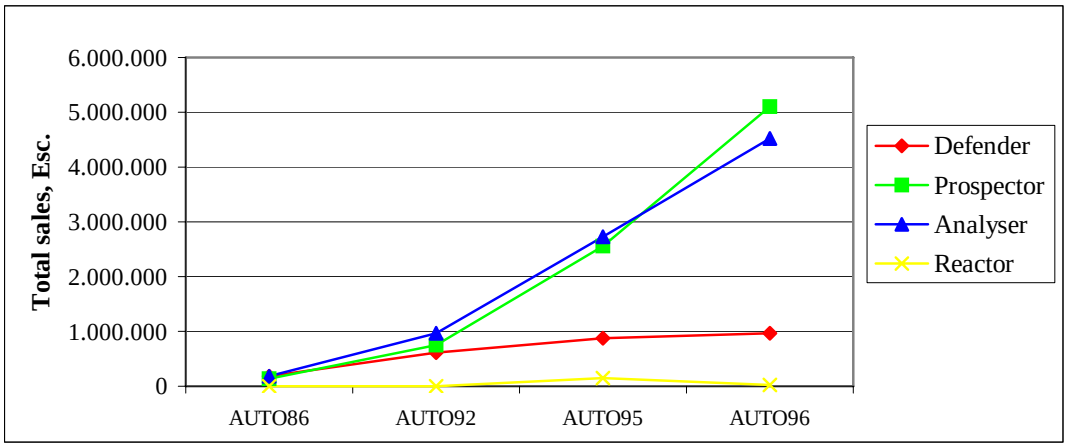


Figure 5E2B - the electric/electronic industry, 1980-96

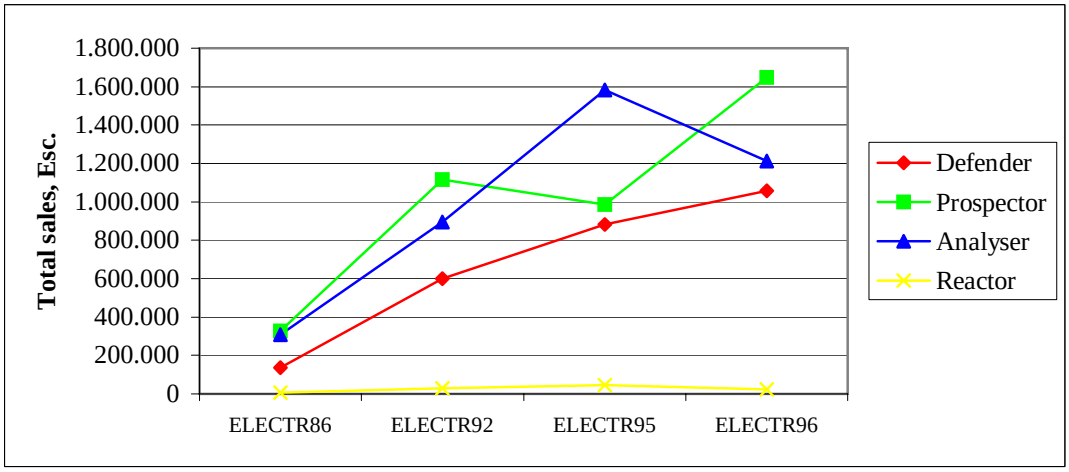


Figure 5E2C - the domestic appliances industry, 1980-96

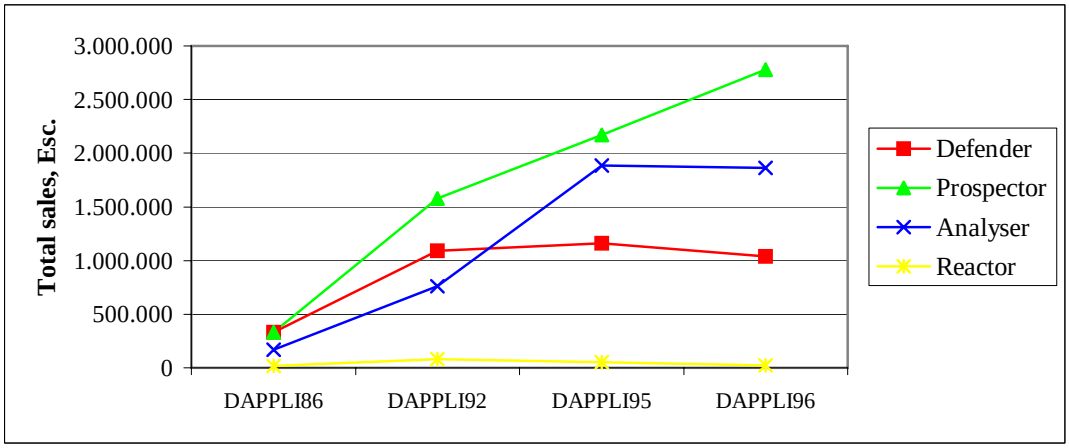


Figure 5E2 Cont. - Strategy types and client industries; the evolution within each client industries, 1980-96

Figure 5E2D - the toy industry, 1980-96

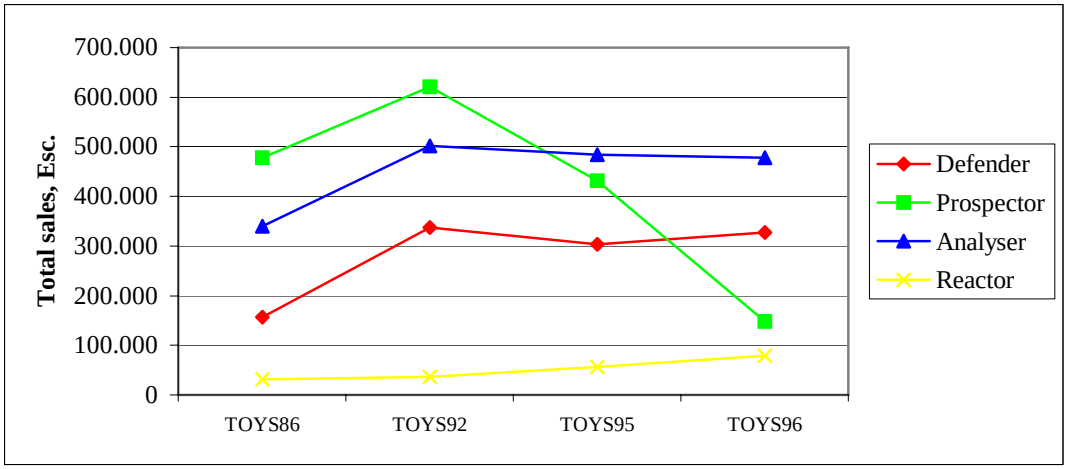


Figure 5E2E - the domestic utilities industry, 1980-96

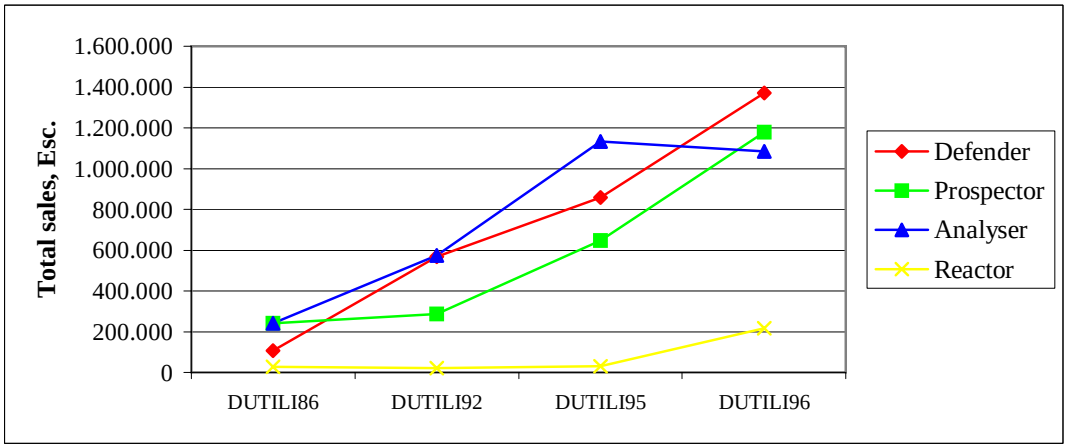


Figure 5E2F - the "other" industry, 1980-96

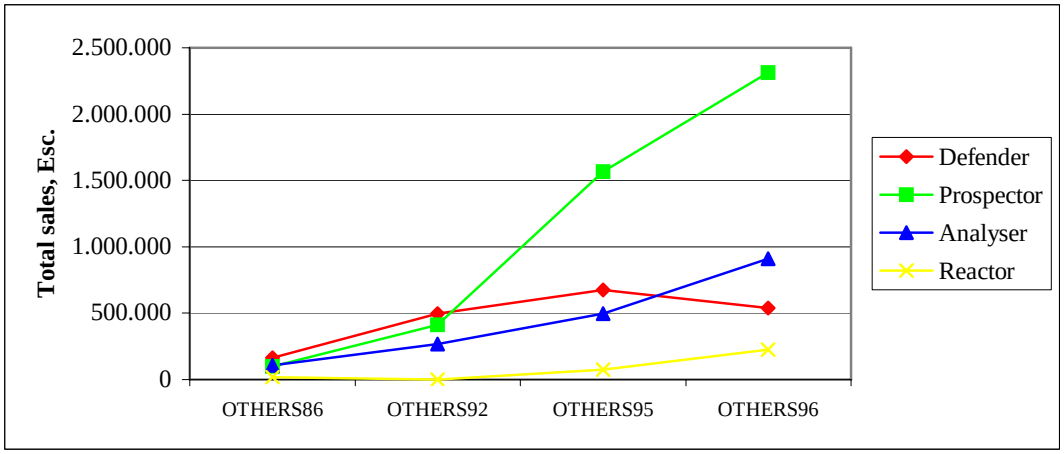


Table 5E3 - Cross-tabulation, the client industries, 1997 (a forecast)

Strategy Types 97 * Automobile industry 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count	5	7		12
		% within Strategy Types 97	41.7%	58.3%		100.0%
	Prospector	Count	7	3	3	13
		% within Strategy Types 97	53.8%	23.1%	23.1%	100.0%
	Analyser	Count	11	13	4	28
		% within Strategy Types 97	39.3%	46.4%	14.3%	100.0%
	Reactor	Count	1			1
		% within Strategy Types 97	100.0%			100.0%
Total		Count	24	23	7	54
		% within Strategy Types 97	44.4%	42.6%	13.0%	100.0%

Strategy Types 97 * Electric/Electronic industry 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count	3	8	1	12
		% within Strategy Types 97	25.0%	66.7%	8.3%	100.0%
	Prospector	Count	6	4	1	11
		% within Strategy Types 97	54.5%	36.4%	9.1%	100.0%
	Analyser	Count	8	15	1	24
		% within Strategy Types 97	33.3%	62.5%	4.2%	100.0%
	Reactor	Count	1			1
		% within Strategy Types 97	100.0%			100.0%
Total		Count	18	27	3	48
		% within Strategy Types 97	37.5%	56.3%	6.3%	100.0%

Strategy Types 97 * Domestic Appliances industry 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count	4	9	1	14
		% within Strategy Types 97	28.6%	64.3%	7.1%	100.0%
	Prospector	Count	5	6	1	12
		% within Strategy Types 97	41.7%	50.0%	8.3%	100.0%
	Analyser	Count	9	14	1	24
		% within Strategy Types 97	37.5%	58.3%	4.2%	100.0%
	Reactor	Count	1			1
		% within Strategy Types 97	100.0%			100.0%
Total		Count	19	29	3	51
		% within Strategy Types 97	37.3%	56.9%	5.9%	100.0%

Table 5E3 Cont. - Cross-tabulation, the client industries, 1997 (a forecast)

Strategy Types 97 * Toy industry 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count	1	2	1	4
		% within Strategy Types 97	25.0%	50.0%	25.0%	100.0%
	Prospector	Count			3	3
		% within Strategy Types 97			100.0%	100.0%
	Analyser	Count	2	6	6	14
		% within Strategy Types 97	14.3%	42.9%	42.9%	100.0%
	Reactor	Count		1		1
		% within Strategy Types 97		100.0%		100.0%
Total		Count	3	9	10	22
		% within Strategy Types 97	13.6%	40.9%	45.5%	100.0%

Strategy Types 97 * Domestic utilities industry 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count	3	5		8
		% within Strategy Types 97	37.5%	62.5%		100.0%
	Prospector	Count	3	5	2	10
		% within Strategy Types 97	30.0%	50.0%	20.0%	100.0%
	Analyser	Count	6	13	2	21
		% within Strategy Types 97	28.6%	61.9%	9.5%	100.0%
	Reactor	Count		1		1
		% within Strategy Types 97		100.0%		100.0%
Total		Count	12	24	4	40
		% within Strategy Types 97	30.0%	60.0%	10.0%	100.0%

Strategy Types 97 * "Other" industry 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count	3	4	1	8
		% within Strategy Types 97	37.5%	50.0%	12.5%	100.0%
	Prospector	Count	2	6	3	11
		% within Strategy Types 97	18.2%	54.5%	27.3%	100.0%
	Analyser	Count	3	8	1	12
		% within Strategy Types 97	25.0%	66.7%	8.3%	100.0%
	Reactor	Count	1		1	2
		% within Strategy Types 97	50.0%		50.0%	100.0%
Total		Count	9	18	6	33
		% within Strategy Types 97	27.3%	54.5%	18.2%	100.0%

Table 5E4 - The client industries of each strategy type across the timescales, 1980-96

Defender 1980-86

Sum
Report

Strategy Types	AUTO	ELECTR	DAPPLI	TOYS	DUTILI	OTHERS
Defender 86	186.154	136.879	332.511	156.897	106.962	165.066
Defender 92	616.847	599.232	1.093.266	337.954	568.497	495.671
Defender 95	870.635	882.124	1.157.731	303.413	857.370	673.491
Defender 96	962.956	1.057.765	1.037.347	327.875	1.369.592	537.809

Prospector 1980-86

Strategy Types	AUTO	ELECTR	DAPPLI	TOYS	DUTILI	OTHERS
Prospector 86	132.223	326.198	329.947	478.061	241.047	96.432
Prospector 92	752.662	1.115.002	1.577.288	621.250	287.184	412.425
Prospector 95	2.560.781	986.251	2.171.503	431.679	647.496	1.565.115
Prospector 96	962.956	1.057.765	1.037.347	327.875	1.369.592	537.809

Analyser 1980-86

Strategy Types	AUTO	ELECTR	DAPPLI	TOYS	DUTILI	OTHERS
Analyser 86	177.280	307.401	169.564	340.005	240.311	109.100
Analyser 92	964.845	894.660	760.481	501.524	573.229	267.577
Analyser 95	2.725.930	1.582.042	1.884.801	484.728	1.131.823	498.671
Analyser 96	4.527.042	1.212.440	1.860.777	478.211	1.084.876	908.621

Reactor 1980-86

Strategy Types	AUTO	ELECTR	DAPPLI	TOYS	DUTILI	OTHERS
Reactor 86	2.194	7.262	18.309	31.528	26.459	20.275
Reactor 92	0	28.012	78.434	36.725	21.342	0
Reactor 95	144.392	45.878	52.961	56.064	31.435	74.234
Reactor 96	21.294	21.294	21.294	78.823	217.211	225.738

Figure 5E4 - The client industries of each strategy type across the timescales, 1980-96.

Figure 5E4A - the client industries, Defenders, 1980-96

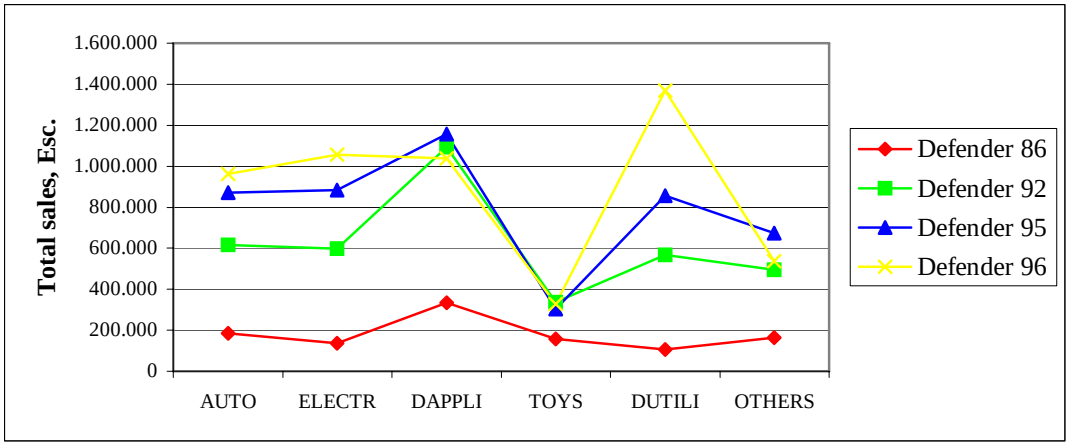


Figure 5E4B - the client industries, Prospectors, 1980-96

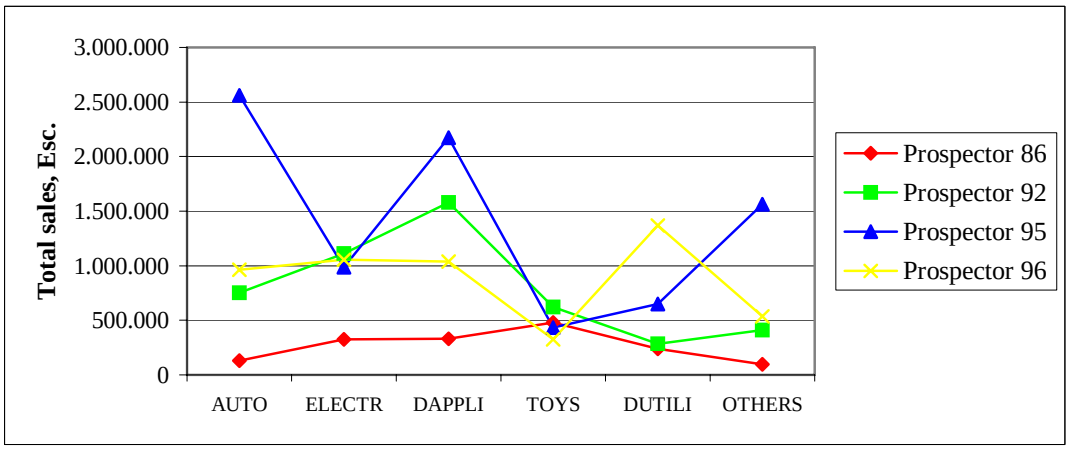


Figure 5E4C - the client industries, Analysers, 1980-96

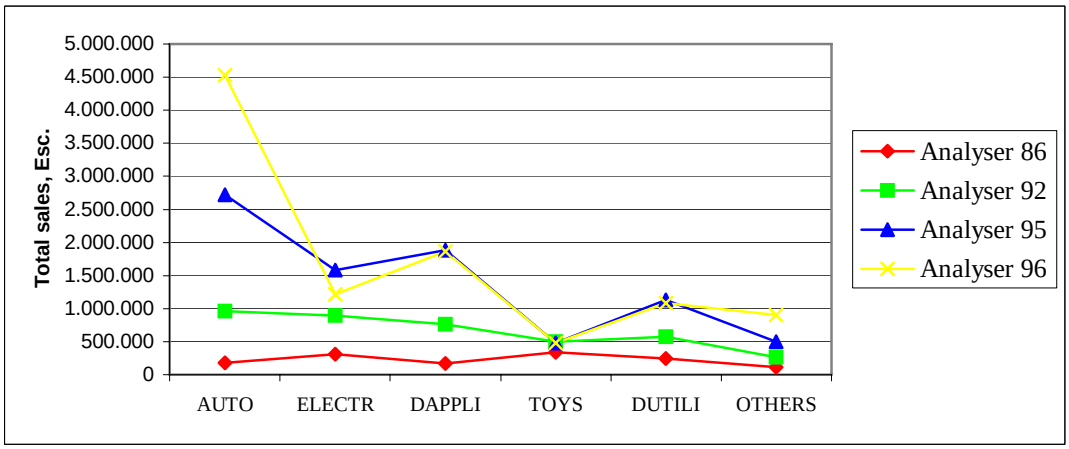
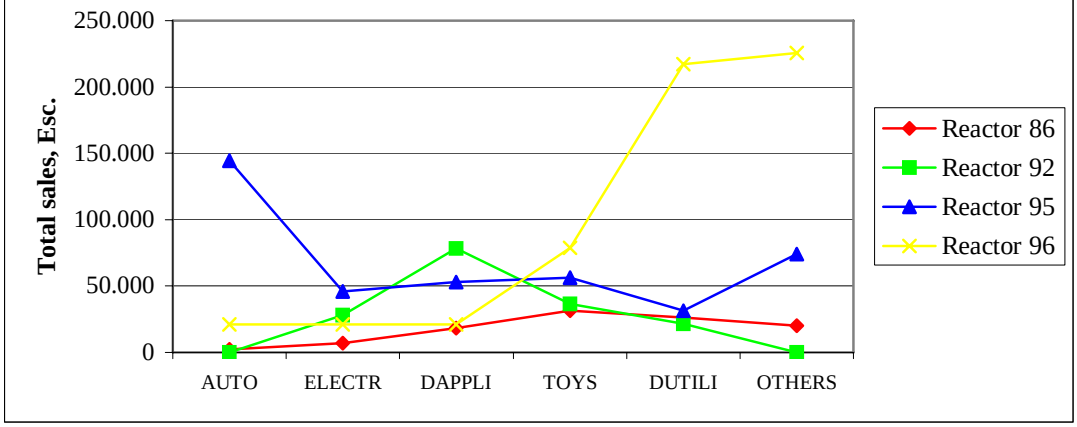


Figure 5E4 Cont. - The client industries of each strategy type across the timescales, 1980-96.

Figure 5E4D - the client industries, Reactors, 1980-96



Appendix 5F - Strategy types and investment policy, 1980-96

Table 5F1 - Strategy types and the areas of investment, 1980-1996

1980-86

Report
Sum

Strategy Types 86	R&D 86	Technology 86	Infrastructures 86	Marketing 86	Customer Relationship 86	Training 86	Total
Defender	0	614.443	548.468	104.342	103.594	55.273	1.426.120
Prospector	0	825.451	77.152	142.384	52.822	57.419	1.155.228
Analyser	10.668	503.652	590.140	59.341	33.629	57.363	1.254.794
Reactor	0	95.904	0	1.279	640	0	97.823
Total	10.668	2.039.450	1.215.760	307.346	190.685	170.055	3.933.965

1987-92

Report
Sum

Strategy Types 92	R&D 92	Technology 92	Infrastructures 92	Marketing 92	Customer Relationship 92	Training 92	Total
Defender	10.749	3.419.579	156.317	435.824	694.822	443.396	5.160.688
Prospector	105.593	2.791.112	660.245	244.905	165.012	194.593	4.161.460
Analyser	70.681	1.813.349	836.113	199.930	99.938	130.692	3.150.703
Reactor	1.181	34.639	0	2.362	1.181	0	39.362
Total	188.204	8.058.679	1.652.675	883.021	960.952	768.682	12.512.213

1993-95

Report
Sum

Strategy Types 95	R&D 95	Technology 95	Infrastructures 95	Marketing 95	Customer Relationship 95	Training 95	Total
Defender	17.500	2.684.556	691.911	301.036	144.376	90.464	3.929.843
Prospector	474.290	5.511.700	660.152	1.219.404	756.743	578.323	9.200.612
Analyser	150.989	4.689.312	697.786	355.870	275.369	209.171	6.378.496
Reactor	2.361	178.733	2.513	4.722	2.361	12.629	203.320
Total	645.140	13.064.301	2.052.362	1.881.031	1.178.849	890.588	19.712.271

1996

Report
Sum

Strategy Types 96	R&D 96	Technology 96	Infrastructures 96	Marketing 96	Customer Relationship 96	Training 96	Total
Defender	66.495	2.717.648	279.727	385.650	110.832	138.529	3.698.880
Prospector	301.137	7.940.424	2.804.311	1.018.101	681.416	633.129	13.378.518
Analyser	262.657	4.674.966	1.947.777	521.908	263.157	316.126	7.986.591
Reactor	0	109.791	0	40.410	10.102	12.199	172.502
Total	630.289	15.442.829	5.031.814	1.966.068	1.065.507	1.099.983	25.236.490

Table 5F2 - Strategy types and the areas of investment; the evolution within each area of investment, 1980-96

Investments in Research &Development, 1980-96

Report
Sum

Strategy Types	Invest. R&D 86	Invest. R&D 92	Invest. R&D 95	Invest. R&D 96
Defender	0	10.749	17.500	66.495
Prospector	0	105.593	474.290	301.137
Analyser	10.668	70.681	150.989	262.657
Reactor	0	1.181	2.361	0

Investments in technology, 1980-96

Strategy Types	Invest. Technology 86	Invest. Technology 92	Invest. Technology 95	Invest. Technology 96
Defender	614.443	3.419.579	2.684.556	2.717.648
Prospector	825.451	2.791.112	5.511.700	7.940.424
Analyser	503.652	1.813.349	4.689.312	4.674.966
Reactor	95.904	34.639	178.733	109.791

Investments in infrastructures, 1980-96

Strategy Types	Invest. Infrastructures 86	Invest. Infrastructures 92	Invest. Infrastructures 95	Invest. Infrastructures 96
Defender	548.468	156.317	691.911	279.727
Prospector	77.152	660.245	660.152	2.804.311
Analyser	590.140	836.113	697.786	1.947.777
Reactor	0	0	2.513	0

Investments in marketing-trading, 1980-96

Strategy Types	Invest. Marketing 86	Invest. Marketing 92	Invest. Marketing 95	Invest. Marketing 96
Defender	104.342	435.824	301.036	385.650
Prospector	142.384	244.905	1.219.404	1.018.101
Analyser	59.341	199.930	355.870	521.908
Reactor	1.279	2.362	4.722	40.410

Investments in customer relationships, 1980-96

Strategy Types	Invest. Cust. Relationship 86	Invest. Cust. Relationship 92	Invest. Cust. Relationship 95	Invest. Cust. Relationship 96
Defender	103.594	694.822	144.376	110.832
Prospector	52.822	165.012	756.743	681.416
Analyser	33.629	99.938	275.369	263.157
Reactor	640	1.181	2.361	10.102

Investments in training, 1980-96

Strategy Types	Invest. Training 86	Invest. Training 92	Invest. Training 95	Invest. Training 96
Defender	55.273	443.396	90.464	138.529
Prospector	57.419	194.593	578.323	633.129
Analyser	57.363	130.692	209.171	316.126
Reactor	0	0	12.629	12.199

Figure 5F2 - Strategy types and the areas of investment; the evolution within each area of investment, 1980-1996

Figure 5F2A - Investments in Research &Development, 1980-96

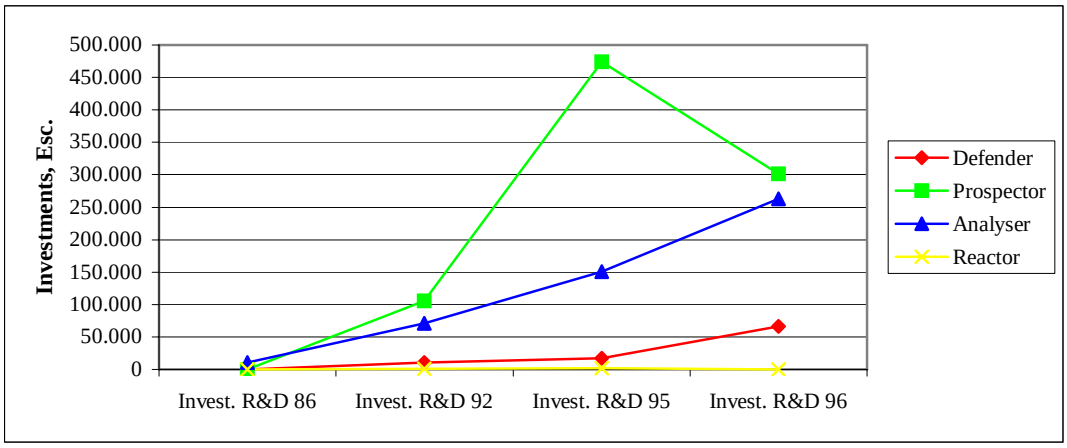


Figure 5F2B - Investments in technology, 1980-96

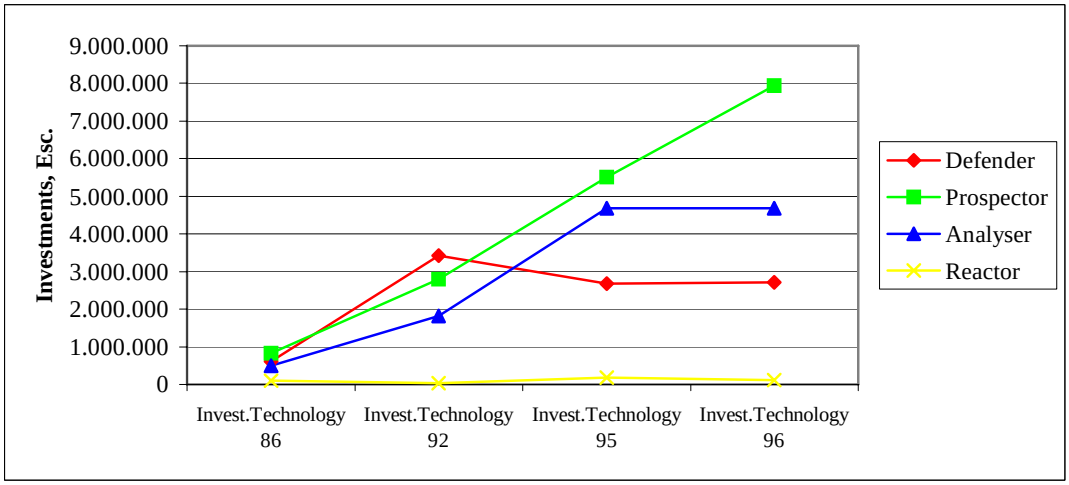


Figure 5F2C- Investments in infrastructures, 1980-96

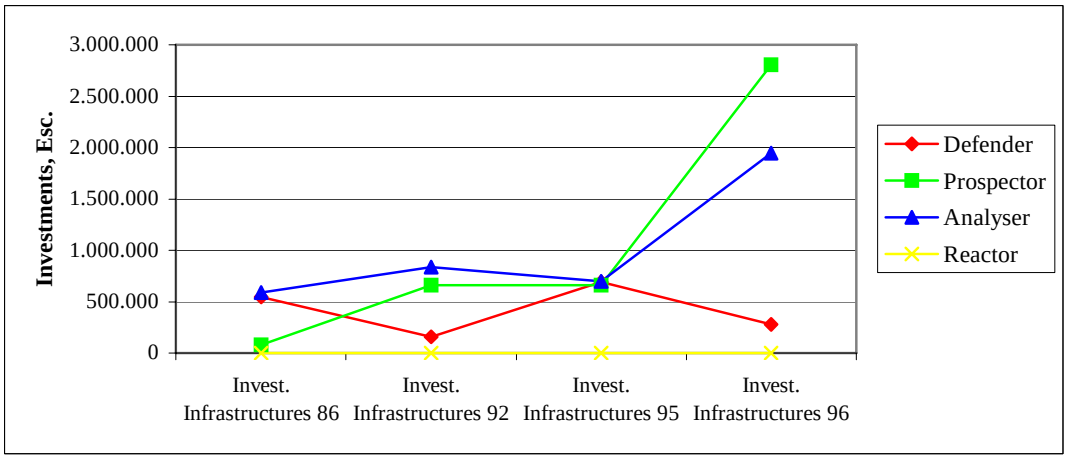


Figure 5F2 Cont. - Strategy types and the areas of investment; the evolution within each area of investment, 1980-1996

Figure 5F2D - Investments in marketing 1980-96

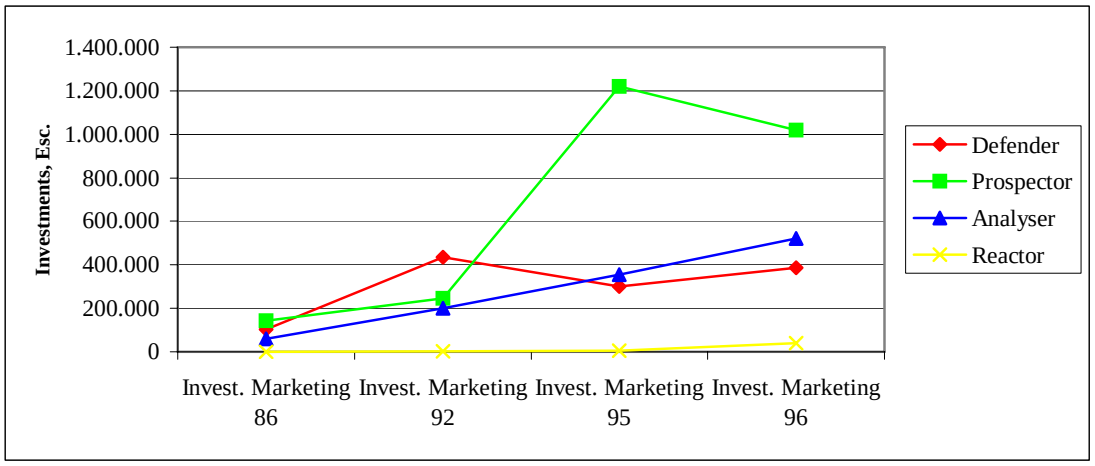


Figure 5F2E - Investments in customer relationships, 1980-96

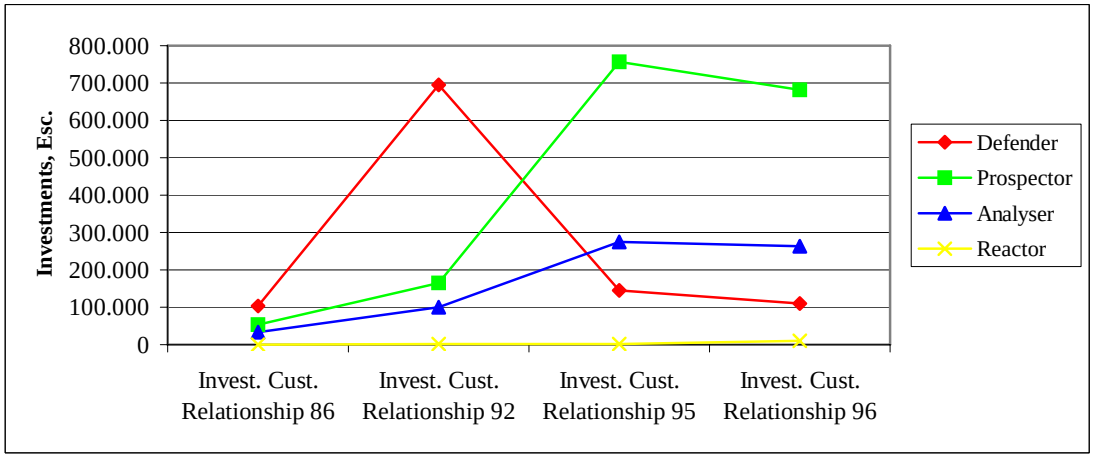


Figure 5F2F - Investments in training, 1980-96

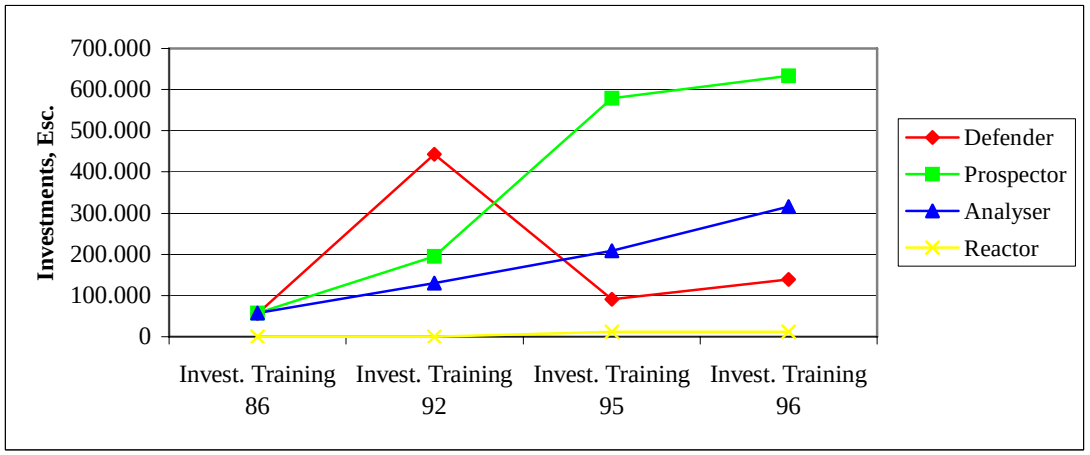


Table 5F3 - Cross-tabulation, the areas of investment, 1997 (a forecast)

Strategy Types 97 * Invest. R&D 97

Cross tab

			Increases	Stable	Total
Strategy Types 97	Defender	Count % within Strategy Types 97		2 100.0%	2 100.0%
	Prospector	Count % within Strategy Types 97	4 40.0%	3 60.0%	5 100.0%
	Analyser	Count % within Strategy Types 97	4 40.0%	6 60.0%	10 100.0%
Total		Count % within Strategy Types 97	6 35.3%	11 64.7%	17 100.0%

Strategy Types 97 * Invest. Technology 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	3 18.8%	12 75.0%	1 6.3%	16 100.0%
	Prospector	Count % within Strategy Types 97	4 30.8%	7 53.8%	2 15.4%	13 100.0%
	Analyser	Count % within Strategy Types 97	9 32.1%	18 64.3%	1 3.6%	28 100.0%
	Reactor	Count % within Strategy Types 97	1 50.0%	1 50.0%		2 100.0%
Total		Count % within Strategy Types 97	17 28.8%	38 64.4%	4 6.8%	59 100.0%

Strategy Types 97 * Invest. Infrastructures 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	3 50.0%	2 33.3%	1 16.7%	6 100.0%
	Prospector	Count % within Strategy Types 97	2 22.2%	4 44.4%	3 33.83%	9 100.0%
	Analyser	Count % within Strategy Types 97	2 14.3%	8 57.1%	4 28.6%	14 100.0%
Total		Count % within Strategy Types 97	7 24.1%	14 48.3%	8 27.6%	29 100.0%

Table 5F3 Cont. - Cross-tabulation, the areas of investment, 1997 (a forecast)

Strategy Types 97 * Invest. Marketing 97

Cross tab

			Increases	Stable	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	3 30.0%	7 70.0%	10 100.0%
	Prospector	Count % within Strategy Types 97	5 38.5%	8 61.5%	13 100.0%
	Analyser	Count % within Strategy Types 97	8 40.0%	12 60.0%	20 100.0%
Total		Count % within Strategy Types 97	16 37.2%	27 62.8%	43 100.0%

Strategy Types 97 * Invest. Customer relationships 97

Cross tab

			Increases	Stable	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	2 28.6%	5 71.4%	7 100.0%
	Prospector	Count % within Strategy Types 97	2 18.2%	9 81.8%	11 100.0%
	Analyser	Count % within Strategy Types 97	7 41.2%	10 58.8%	17 100.0%
Total		Count % within Strategy Types 97	11 31.4%	24 68.6%	35 100.0%

Strategy Types 97 * Invest. Training 97

Cross tab

			Increases	Stable	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	2 20.0%	8 80.0%	10 100.0%
	Prospector	Count % within Strategy Types 97	6 50.0%	6 50.0%	12 100.0%
	Analyser	Count % within Strategy Types 97	4 28.6%	10 71.4%	14 100.0%
	Reactor	Count % within Strategy Types 97		1 100.0%	1 100.0%
Total		Count % within Strategy Types 97	12 32.4%	25 67.6%	37 100.0%

Appendix 5G - Strategy types and the technological profile

Table 5G1 - Strategy types and technological investments, 1980-96

Report
Sum

Strategy types 86	Conv.86	CAD/CAM/ CAE 86	CNC 86	EDM 86	Wire cutting 86	Laser 86	Quality 86	Test injection 86
Defender	749.137	53.668	577.627	54.153	0	0	0	0
Prospector	561.906	66.827	320.185	149.235	34.272	0	22.803	0
Analyser	313.617	231.349	271.657	294.184	136.616	0	7.371	0
Reactor	65.842	0	15.991	15.991	0	0	0	0
Total	1.690.501	351.845	1.185.461	513.563	170.888	0	30.174	0

Report
Sum

Strategy types 92	Conv.92	CAD/CAM/ CAE 92	CNC 92	EDM 92	Wire cutting 92	Laser 92	Quality 92	Test injection 92
Defender	814.282	1.520.456	1.469.175	822.796	108.238	31.500	326.272	73.545
Prospector	696.870	1.128.220	1.403.330	643.868	62.498	0	238.643	7.638
Analyser	201.209	1.205.243	629.403	267.290	92.540	0	639.792	65.126
Reactor	25.585	0	5.904	5.904	0	0	1.968	0
Total	1.737.947	3.853.919	3.507.812	1.739.858	263.276	31.500	1.206.675	146.309

Report
Sum

Strategy types 95	Conv.95	CAD/CAM/ CAE 95	CNC 95	EDM 95	Wire cutting 95	Laser 95	Quality 95	Test injection 95
Defender	161.422	728.249	2.310.301	428.462	52.563	0	177.332	5.269
Prospector	1.975.427	2.421.131	2.490.841	927.729	179.939	0	1.064.955	301.357
Analyser	498.319	641.367	1.769.412	681.291	1.662.385	0	321.959	476.894
Reactor	23.611	132.488	31.481	11.805	0	0	3.935	0
Total	2.658.778	3.923.235	6.602.034	2.049.287	1.894.887	0	1.568.180	783.520

Report
Sum

Strategy types 96	Conv.96	CAD/CAM/ CAE 96	CNC 96	EDM 96	Wire cutting 96	Laser 96	Quality 96	Test injection 96
Defender	15.537	1.741.568	1.157.156	434.547	129.043	0	169.432	0
Prospector	2.413.985	3.035.345	3.183.284	766.620	550.323	0	1.574.861	1.810.569
Analyser	168.267	2.854.449	2.441.383	339.090	176.741	0	1.777.809	391.628
Reactor	0	24.398	97.592	0	0	0	0	0
Total	2.597.788	7.655.760	6.879.415	1.540.256	856.106	0	3.522.103	2.202.197

Table 5G2 - Strategy types and technological investments; the evolution within each technology, 1980-96

Strategy Types	Conventional equipment 86	Conventional equipment 92	Conventional equipment95	Conventional equipment 96
Defender	749.137	814.282	161.422	15.537
Prospector	561.906	696.870	1.975.427	2.413.985
Analyser	313.617	201.209	498.319	168.267
Reactor	65.842	25.585	23.611	0
Total	1.690.501	1.737.947	2.658.778	2.597.788

Strategy Types	CAD/CAM/ CAE systems 86	CAD/CAM/ CAE systems 92	CAD/CAM/ CAE systems 95	CAD/CAM/ CAE systems 96
Defender	53.668	1.520.456	728.249	1.741.568
Prospector	66.827	1.128.220	2.421.131	3.035.345
Analyser	231.349	1.205.243	641.367	2.854.449
Reactor	0	0	132.488	24.398
Total	351.845	3.853.919	3.923.235	7.655.760

Strategy Types	CNC systems 86	CNC systems 92	CNC systems 95	CNC systems 96
Defender	577.627	1.469.175	2.310.301	1.157.156
Prospector	320.185	1.403.330	2.490.841	3.183.284
Analyser	271.657	629.403	1.769.412	2.441.383
Reactor	15.991	5.904	31.481	97.592
Total	1.185.461	3.507.812	6.602.034	6.879.415

Strategy Types	EDM equipment 86	EDM equipment 86	EDM equipment 86	EDM equipment 86
Defender	54.153	822.796	428.462	434.547
Prospector	149.235	643.868	927.729	766.620
Analyser	294.184	267.290	681.291	339.090
Reactor	15.991	5.904	11.805	0
Total	513.563	1.739.858	2.049.287	1.540.256

Strategy Types	Wire cutting equipment 86	Wire cutting equipment 92	Wire cutting equipment 95	Wire cutting equipment 96
Defender	0	108.238	52.563	129.043
Prospector	34.272	62.498	179.939	550.323
Analyser	136.616	92.540	1.662.385	176.741
Reactor	0	0	0	0
Total	170.888	263.276	1.894.887	856.106

Table 5G2 Cont. - Strategy types and technological investments; the evolution within each technology, 1980-96

Strategy Types	Laser equipment 86	Laser equipment 92	Laser equipment 95	Laser equipment 96
Defender	0	31.500	0	0
Prospector	0	0	0	0
Analyser	0	0	0	0
Reactor	0	0	0	0
Total	0	31.500	0	0

Strategy Types	Quality control 86	Quality control 92	Quality control 95	Quality control 96
Defender	0	326.272	177.332	169.432
Prospector	22.803	238.643	1.064.955	1.574.861
Analyser	7.371	639.792	321.959	1.777.809
Reactor	0	1.968	3.935	0
Total	30.174	1.206.675	1.568.180	3.522.103

Strategy Types	Test injection equipment 86	Test injection equipment 92	Test injection equipment 95	Test injection equipment 96
Defender	0	73.545	5.269	0
Prospector	0	7.638	301.357	1.810.569
Analyser	0	65.126	476.894	391.628
Reactor	0	0	0	0
Total	0	146.309	783.520	2.202.197

Figure 5G2 - Strategy types and technological investments; the evolution within each technology 1980-96

Figure 5G2A - the conventional equipment, 1980-96

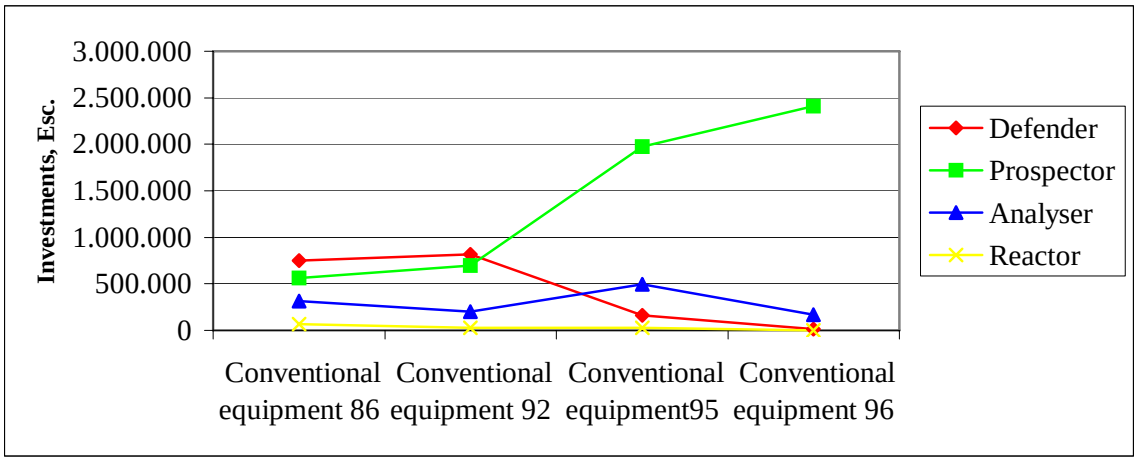


Figure 5G2B - the CAD/CAM/CAE systems, 1980-96

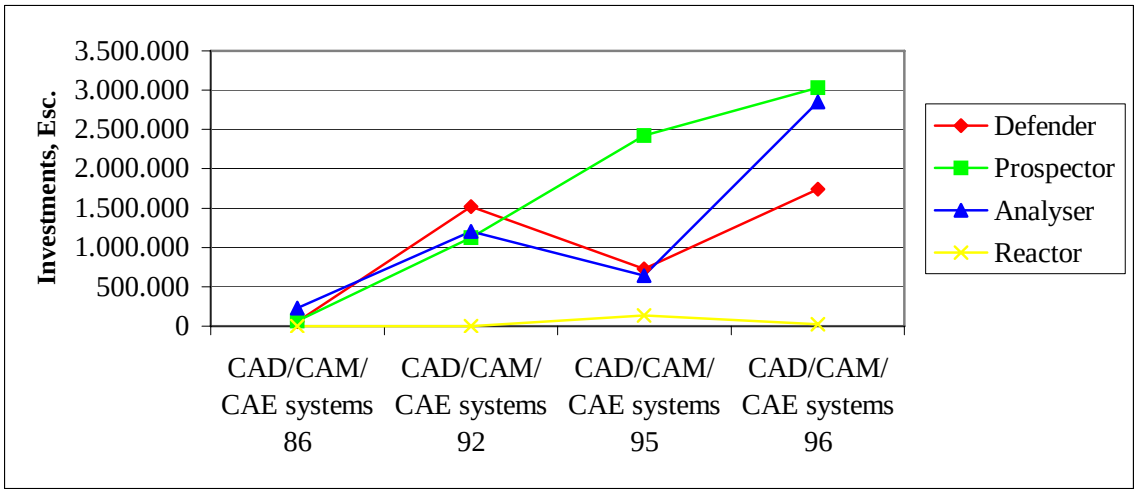


Figure 5G2C - the CNC systems, 1980-96

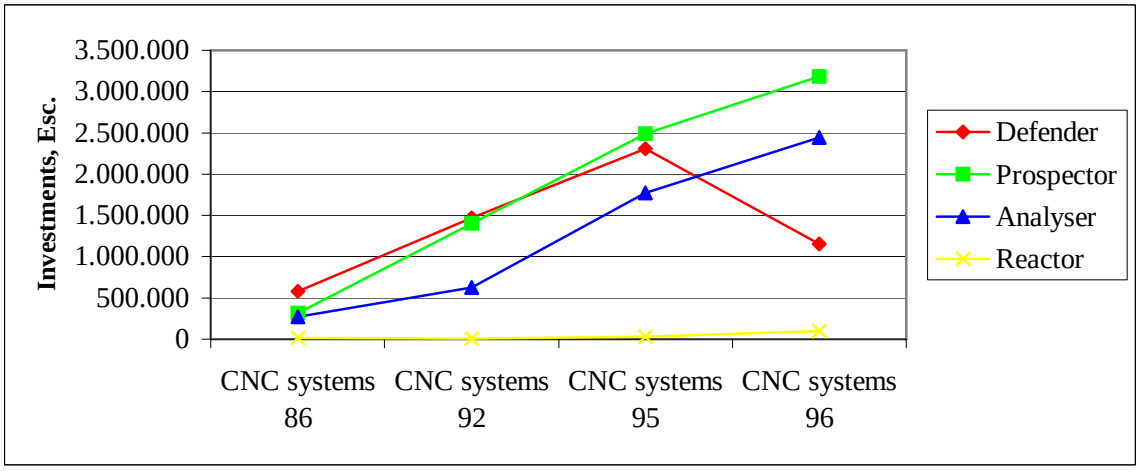


Figure 5G2 Cont. - Strategy types and technological investments; the evolution within each technology, 1980-96

Figure 5G2D - the EDM equipment, 1980-96

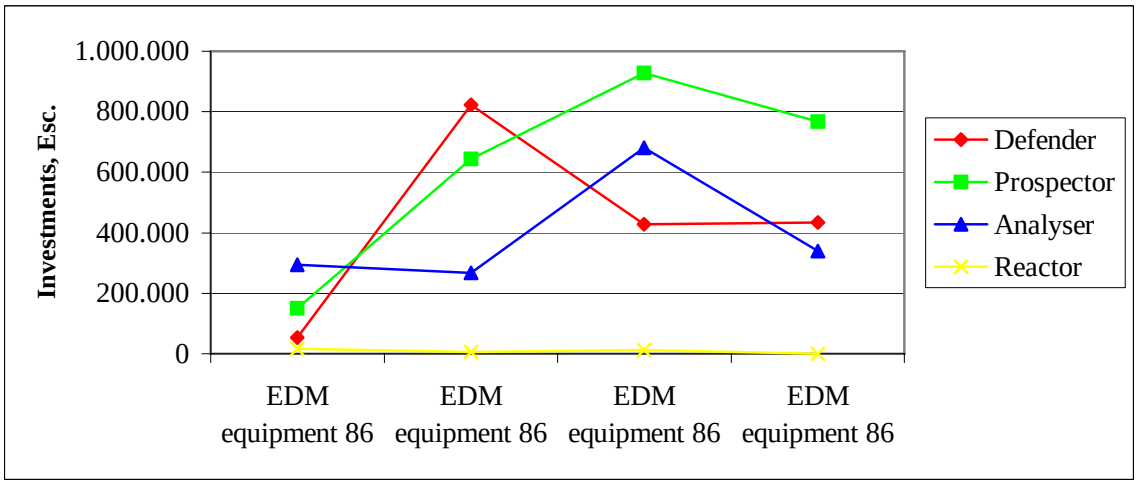


Figure 5G2E - the Wire cutting equipment, 1980-96

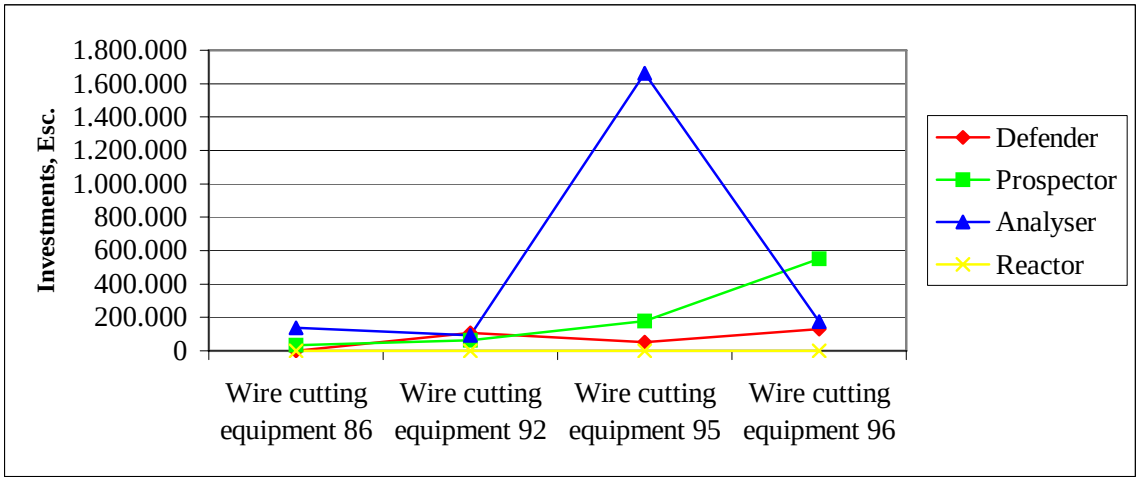


Figure 5G2F - the laser equipment, 1980-96

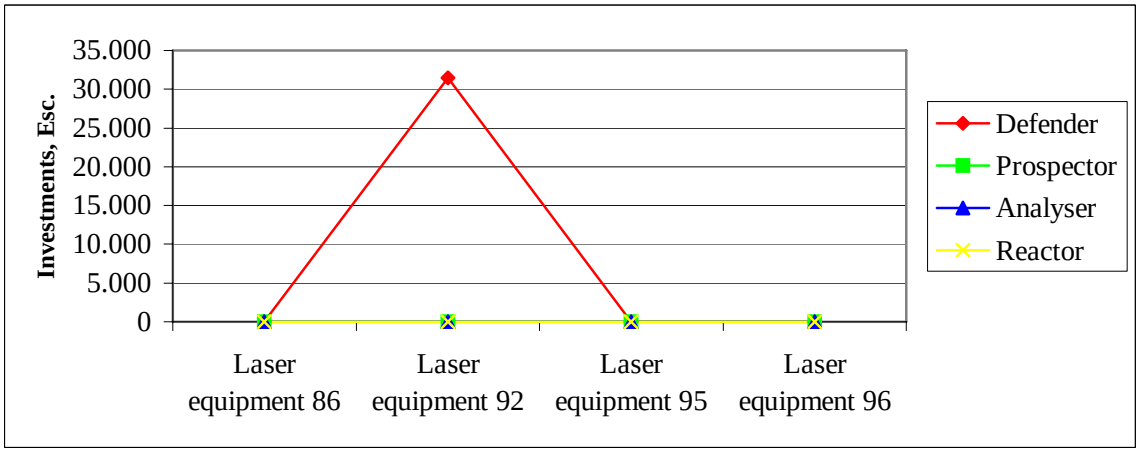


Figure 5G2 Cont. - Strategy types and technological investments; the evolution within each technology, 1980-96

Figure 5I2G - the quality control equipment, 1980-96

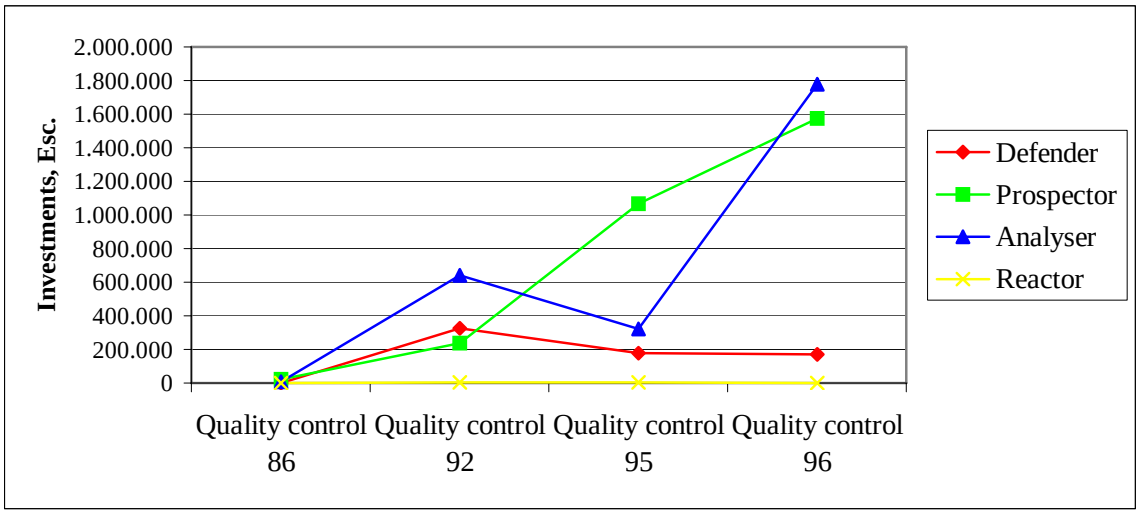


Figure 5G2H - the test injection equipment, 1980-96

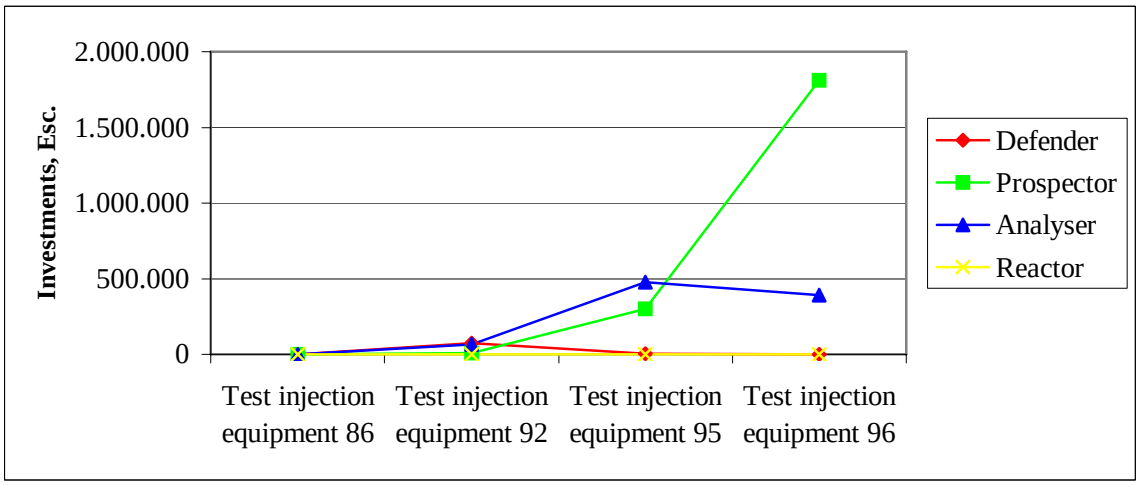


Table 5G3 - Cross-tabulation, the technological investments, 1997 (a forecast)

Strategy Types 97 * Invest. Conventional equipment 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Prospector	Count % within Strategy Types 97	4 66.7%		2 33.3%	6 100.0%
	Analyser	Count % within Strategy Types 97	2 50.0%	1 25.0%	1 25.0%	4 100.0%
Total		Count % within Strategy Types 97	6 60.0%	1 10.0%	3 30.0%	10 100.0%

Strategy Types 97 * Invest. CAD/CAM/CAE systems 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	4 33.3%	5 41.7%	3 25.0%	12 100.0%
	Prospector	Count % within Strategy Types 97	4 33.3%	5 41.7%	3 25.0%	12 100.0%
	Analyser	Count % within Strategy Types 97	6 31.6%	9 47.4%	4 21.1%	19 100.0%
	Reactor	Count % within Strategy Types 97	1 100.0%			1 100.0%
Total		Count % within Strategy Types 97	15 34.1%	19 43.2%	10 22.7%	44 100.0%

Strategy Types 97 * Invest. CNC systems 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count % within Strategy Types 97	8 61.5%	5 38.5%		13 100.0%
	Prospector	Count % within Strategy Types 97	3 33.3%	3 33.3%	3 33.3%	9 100.0%
	Analyser	Count % within Strategy Types 97	10 50.0%	8 40.0%	2 10.0%	20 100.0%
	Reactor	Count % within Strategy Types 97	1 100.0%			1 100.0%
Total		Count % within Strategy Types 97	22 51.2%	16 37.2%	5 11.6%	43 100.0%

Table 5G3 Cont. - Cross-tabulation, the technological investments, 1997 (a forecast)

Strategy Types 97 * Invest. EDM equipment 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count	1	3	1	5
		% within Strategy Types 97	20.0%	60.0%	20.0%	100.0%
	Prospector	Count	2	2	1	5
		% within Strategy Types 97	40.0%	40.0%	20.0%	100.0%
	Analyser	Count	3	4		7
		% within Strategy Types 97	42.9%	57.1%		100.0%
Total		Count	6	9	2	17
		% within Strategy Types 97	35.3%	52.9%	11.8%	100.0%

Strategy Types 97 * Invest. Wire cutting equipment 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count	1		1	2
		% within Strategy Types 97	50.0%		50.0%	100.0%
	Prospector	Count	1	1		2
		% within Strategy Types 97	50.0%	50.0%		100.0%
	Analyser	Count	4			4
		% within Strategy Types 97	100.0%			100.0%
Total		Count	6	1	1	8
		% within Strategy Types 97	75.0%	12.5%	12.5%	100.0%

Strategy Types 97 * Invest. Laser equipment 97

Cross tab

			Increases	Total
Strategy Types 97	Analyser	Count	1	1
		% within Strategy Types 97	100.0%	100.0%
Total		Count	1	1
		% within Strategy Types 97	100.0%	100.0%

Table 5G3 Cont. - Cross-tabulation, the technological investments, 1997 (a forecast)

Strategy Types 97 * Quality control equipment 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Defender	Count	2	1		3
		% within Strategy Types 97	66.7%	33.3%		100.0%
	Prospector	Count	7	2	1	10
		% within Strategy Types 97	70.0%	20.0%	10.0%	100.0%
	Analyser	Count	3	5		8
		% within Strategy Types 97	37.5%	62.5%		100.0%
Total		Count	12	8	1	21
		% within Strategy Types 97	57.1%	38.1%	4.8%	100.0%

Strategy Types 97 * Injection test equipment 97

Cross tab

			Increases	Stable	Decreases	Total
Strategy Types 97	Prospector	Count	1	1		2
		% within Strategy Types 97	50.0%	50.0%		100.0%
	Analyser	Count	1	1		2
		% within Strategy Types 97	50.0%	50.0%		100.0%
Total		Count	2	2		4
		% within Strategy Types 97	50.0%	50.0%		100.0%

Table 5G4 - The technological investments of each strategy type across the timescales, 1980-96

Defender 1980-86

Strategy Types	Conv.	CAD/CAM/ CAE	CNC	EDM	Wire cutting	Laser	Quality	Test injection
Defender 86	749.137	53.668	577.627	54.153	0	0	0	0
Defender 92	814.282	1.520.456	1.469.175	822.796	108.238	31.500	326.272	73.545
Defender 95	161.422	728.249	2.310.301	428.462	52.563	0	177.332	5.269
Defender 96	15.537	1.741.568	1.157.156	434.547	129.043	0	169.432	0

Prospector 1980-86

Strategy Types	Conv.	CAD/CAM/ CAE	CNC	EDM	Wire cutting	Laser	Quality	Test injection
Prospector 86	561.906	66.827	320.185	149.235	34.272	0	22.803	0
Prospector 92	696.870	1.128.220	1.403.330	643.868	62.498	0	238.643	7.638
Prospector 95	1.975.427	2.421.131	2.490.841	927.729	179.939	0	1.064.955	301.357
Prospector 96	2.413.985	3.035.345	3.183.284	766.620	550.323	0	1.574.861	1.810.569

Analyser 1980-86

Strategy Types	Conv.	CAD/CAM/ CAE	CNC	EDM	Wire cutting	Laser	Quality	Test injection
Analyser 86	313.617	231.349	271.657	294.184	136.616	0	7.371	0
Analyser 92	201.209	1.205.243	629.403	267.290	92.540	0	639.792	65.126
Analyser 95	498.319	641.367	1.769.412	681.291	1.662.385	0	321.959	476.894
Analyser 96	168.267	2.854.449	2.441.383	339.090	176.741	0	1.777.809	391.628

Reactor 1980-86

Strategy Types	Conv.	CAD/CAM/ CAE	CNC	EDM	Wire cutting	Laser	Quality	Test injection
Reactor 86	65.842	0	15.991	15.991	0	0	0	0
Reactor 92	25.585	0	5.904	5.904	0	0	1.968	0
Reactor 95	23.611	132.488	31.481	11.805	0	0	3.935	0
Reactor 96	0	24.398	97.592	0	0	0	0	0

Figure 5G4 - The technological investments of each strategy type across the timescales, 1980-96

Figure 5G4A - The technological investments, Defenders, 1980-96

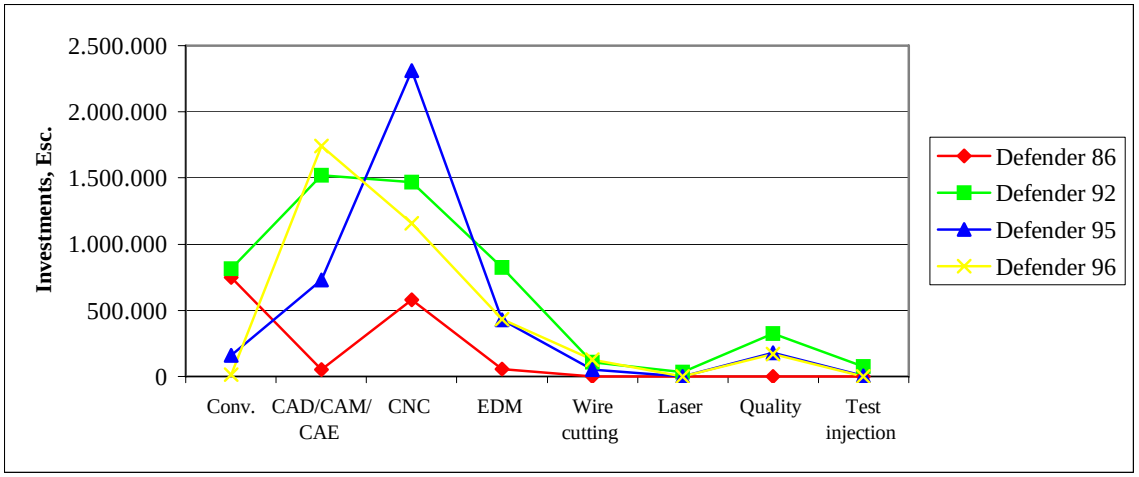


Figure 5G4B - The technological investments, Prospectors, 1980-96

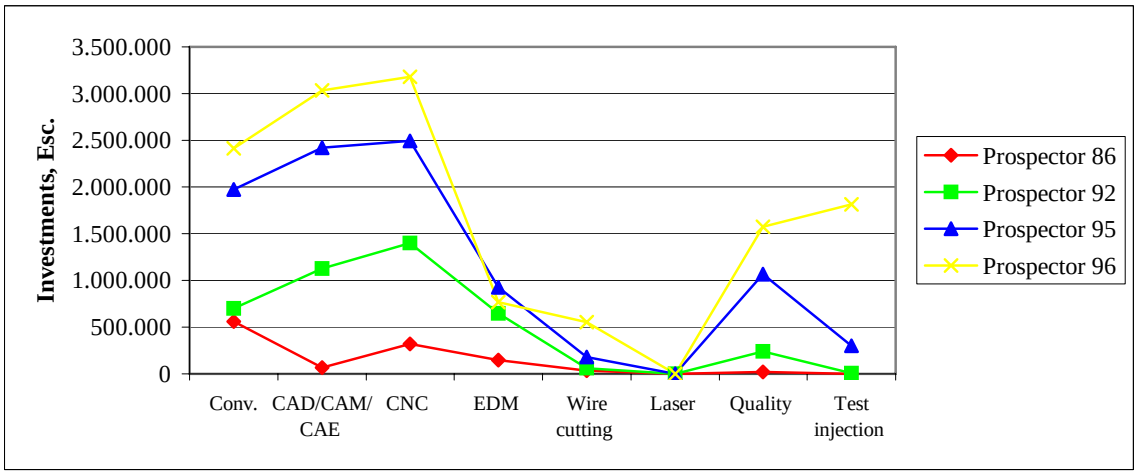


Figure 5G4C - The technological investments, Analysers, 1980-96

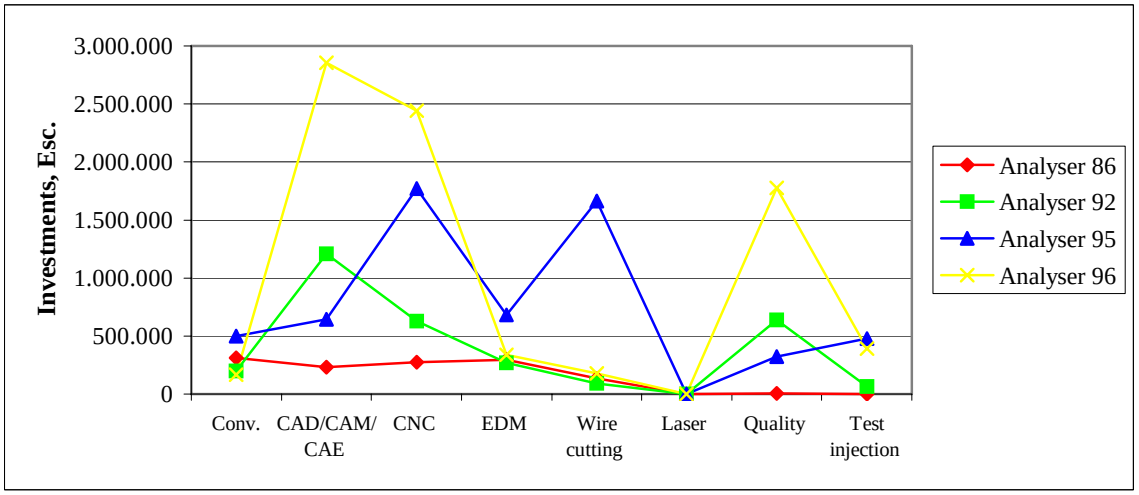


Figure 5G4 Cont. - The technological investments of each strategy type across the timescales, 1980-96

Figure 5G4D - The technological investments, Reactors, 1980-96

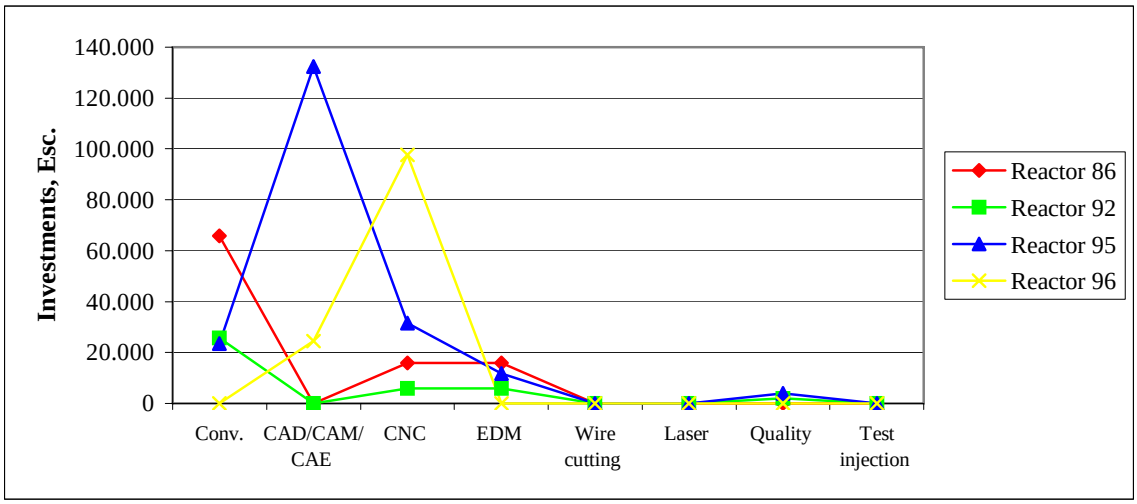


Table 5G5 - Cross-tabulation, strategy types and the technological re-engineering process, 1996

Re-engineering conventional equipment

Strategy Types	1-2 years	3-5 years	6-10 years	over 10 years	Total
Defender	6,3%		18,8%	75,0%	100,0%
Prospector		18,8%	37,5%	43,8%	100,0%
Analyser		8,0%	8,0%	84,0%	100,0%
Reactor		33,3%	33,3%	33,3%	100,0%
Total	1,7%	10,0%	20,0%	68,3%	100,0%

Re-engineering CAD/CAM/CAE systems

Strategy Types	within 1 year	1-2 years	3-5 years	over 10 years	Total
Defender	52,9%	41,2%	5,9%		100,0%
Prospector	25,0%	50,0%	25,0%		100,0%
Analyser	26,9%	46,2%	23,1%	3,8%	100,0%
Reactor		66,7%	33,3%		100,0%
	32,3%	46,8%	19,4%	1,6%	100,0%

Re-engineering CNC systems

Strategy Types	3-5 years	6-10 years	over 10 years	Total
Defender	83,3%	5,6%	11,1%	100,0%
Prospector	66,7%	20,0%	13,3%	100,0%
Analyser	88,5%	7,7%	3,8%	100,0%
Reactor	66,7%	33,3%		100,0%
Total	80,6%	11,3%	8,1%	100,0%

Re-engineering EDM equipment

Strategy Types	3-5 years	6-10 years	over 10 years	Total
Defender	58,8%	29,4%	11,8%	100,0%
Prospector	56,3%	25,0%	18,8%	100,0%
Analyser	57,7%	38,5%	3,8%	100,0%
Reactor	33,3%	66,7%		100,0%
Total	56,5%	33,9%	9,7%	100,0%

Re-engineering wire cutting equipment

Strategy Types	3-5 years	6-10 years	over 10 years	Total
Defender	60,0%	20,0%	20,0%	100,0%
Prospector	36,4%	45,5%	18,2%	100,0%
Analyser	50,0%	50,0%		100,0%
Reactor	100,0%			100,0%
Total	48,1%	40,7%	11,1%	100,0%

Table 5G5 Cont. - Cross-tabulation, strategy types and the technological re-engineering process, 1996

Re-engineering laser equipment

Strategy Types	1-2 years	3-5 years	Total
Prospector	100,0%		100,0%
Analyser		100,0%	100,0%
	50,0%	50,0%	100,0%

Re-engineering quality control equipment

Strategy Types	1-2 years	3-5 years	6-10 years	over 10 years	Total
Defender		25,0%	75,0%		100,0%
Prospector	37,5%	37,5%	18,8%	6%	100,0%
Analyser	37,5%	50,0%	6,3%	6%	100,0%
	27,3%	38,6%	29,5%	5%	100,0%

Re-engineering test injection equipment

Strategy Types	3-5 years	6-10 years	over 10 years	Total
Defender			100,0%	100,0%
Prospector	16,7%	50,0%	33,3%	100,0%
Analyser		66,7%	33,3%	100,0%
	9,1%	45,5%	45,5%	100,0%

Table 5G6 - Cross-tabulation, strategy types and the technology in which they work in shifts, 1996

Strategy Types 96 * Working in shifts conventional equipment

Cross tab

			not working in shifts	2 shifts	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	16 88,9%	2 11,1%	18 100,0%
	Prospector	Count % within Strategy Types 96	14 87,5%	2 12,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	24 92,3%	2 7,7%	26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	57 90,5%	6 9,5%	63 100,0%

Strategy Types 96 * Working in shifts CAD/CAM/CAE systems

Cross tab

			not working in shifts	2 shifts	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	17 94,4%	1 5,6%	18 100,0%
	Prospector	Count % within Strategy Types 96	15 93,8%	1 6,3%	16 100,0%
	Analyser	Count % within Strategy Types 96	26 100,0%		26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	61 96,8%	2 3,2%	63 100,0%

Table 5G6 Cont. - Cross-tabulation, strategy types and the technology in which they work in shifts, 1996

Strategy Types 96 * Working in shifts CNC systems

Cross tab

			not working in shifts	2 shifts	Total
Strategy Types 96	Defender	Count	10	8	18
		% within Strategy Types 96	55,6%	44,4%	100,0%
	Prospector	Count	4	12	16
		% within Strategy Types 96	25,0%	75,0%	100,0%
	Analyser	Count	7	19	26
		% within Strategy Types 96	26,9%	73,1%	100,0%
	Reactor	Count	2	1	3
		% within Strategy Types 96	66,7%	33,3%	100,0%
Total		Count	23	40	63
		% within Strategy Types 96	36,5%	63,5%	100,0%

Strategy Types 96 * Working in shifts EDM equipment

Cross tab

			not working in shifts	2 shifts	Total
Strategy Types 96	Defender	Count	11	7	18
		% within Strategy Types 96	61,1%	38,9%	100,0%
	Prospector	Count	4	12	16
		% within Strategy Types 96	25,0%	75,0%	100,0%
	Analyser	Count	5	21	26
		% within Strategy Types 96	19,2%	80,8%	100,0%
	Reactor	Count	2	1	3
		% within Strategy Types 96	66,7%	33,3%	100,0%
Total		Count	22	41	63
		% within Strategy Types 96	34,9%	65,1%	100,0%

Table 5G6 Cont. - Cross-tabulation, strategy types and the technology in which they work in shifts, 1996

Strategy Types 96 * Working in shifts wire cutting equipment

Cross tab

			not working in shifts	2 shifts	3 shifts	Total
Strategy Types 96	Defender	Count	14	4		18
		% within Strategy Types 96	77,8%	22,2%		100,0%
	Prospector	Count	13	2	1	16
		% within Strategy Types 96	81,3%	12,5%	6,3%	100,0%
	Analyser	Count	23	3		26
		% within Strategy Types 96	88,5%	11,5%		100,0%
	Reactor	Count	3			3
		% within Strategy Types 96	100,0%			100,0%
Total		Count	53	9	1	63
		% within Strategy Types 96	84,1%	14,3%	1,6%	100,0%

Strategy Types 96 * Working in shifts laser equipment

Cross tab

			not working in shifts	2 shifts	Total
Strategy Types 96	Defender	Count	17	1	18
		% within Strategy Types 96	94,4%	5,6%	100,0%
	Prospector	Count	16		16
		% within Strategy Types 96	100,0%		100,0%
	Analyser	Count	16		26
		% within Strategy Types 96	100,0%		100,0%
	Reactor	Count	3		3
		% within Strategy Types 96	100,0%		100,0%
Total		Count	62	1	63
		% within Strategy Types 96	98,4%	1,6%	100,0%

Table 5G6 Cont. - Cross-tabulation, strategy types and the technology in which they work in shifts, 1996

Strategy Types 96 * Working in shifts quality control equipment

Cross tab

			not working in shifts	2 shifts	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	17 94,4%	1 5,6%	18 100,0%
	Prospector	Count % within Strategy Types 96	15 93,8%	1 6,3%	16 100,0%
	Analyser	Count % within Strategy Types 96	26 100,0%		26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	61 96,8%	2 3,2%	63 100,0%

Strategy Types 96 * Working in shifts injection test equipment

Cross tab

			not working in shifts	2 shifts	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	17 94,4%	1 5,6%	18 100,0%
	Prospector	Count % within Strategy Types 96	14 87,5%	2 12,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	26 100,0%		26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	60 95,2%	3 4,8%	63 100,0%

Table 5G7 - Cross-tabulation, strategy types and the technology automation ratio, 1996

Strategy Types 96 * Automatio ratio for conventional equipment

Cross tab

			1 employee for 1 equipment	1 employee for 2 equipment	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	18 100,0%		18 100,0%
	Prospector	Count % within Strategy Types 96	16 100,0%		16 100,0%
	Analyser	Count % within Strategy Types 96	26 100,0%		26 100,0%
	Reactor	Count % within Strategy Types 96	2 66,7%	1 33,3%	3 100,0%
Total		Count % within Strategy Types 96	62 98,4%	1 1,6%	63 100,0%

Strategy Types 96 * Automatio ratio for CAD/CAM/CAE systems

Cross tab

			1 employee for 1 equipment	1 employee for 2 equipment	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	17 100,0%		17 100,0%
	Prospector	Count % within Strategy Types 96	15 93,8%	1 6,3%	16 100,0%
	Analyser	Count % within Strategy Types 96	26 100,0%		26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	61 98,4%	1 1,6%	62 100,0%

Table 5G7 Cont. - Cross-tabulation, strategy types and the technology automation ratio, 1996

Strategy Types 96 * Automatio ratio for CNC systems

Cross tab

			1 employee for 1 equipment	1 employee for 2 equipment	1 employee for 3 equipment	Total
Strategy Types 96	Defender	Count	7	10	1	18
		% within Strategy Types 96	38,9%	55,6%	5,6%	100,0%
	Prospector	Count	5	9	1	15
		% within Strategy Types 96	33,3%	60,0%	6,7%	100,0%
	Analyser	Count	6	17	3	26
		% within Strategy Types 96	23,1%	65,4%	11,5%	100,0%
	Reactor	Count	1	2		3
		% within Strategy Types 96	33,3%	66,7%		100,0%
Total		Count	19	38	5	62
		% within Strategy Types 96	30,6%	61,3%	8,1%	100,0%

Strategy Types 96 * Automatio ratio for EDM equipment

Cross tab

			1 employee for 1 equipment	1 employee for 2 equipment	1 employee for 3 equipment	Total
Strategy Types 96	Defender	Count	5	8	4	17
		% within Strategy Types 96	29,4%	47,1%	23,5%	100,0%
	Prospector	Count	2	8	6	16
		% within Strategy Types 96	12,5%	50,0%	37,5%	100,0%
	Analyser	Count	1	17	8	26
		% within Strategy Types 96	3,8%	65,4%	30,8%	100,0%
	Reactor	Count	1	1	1	3
		% within Strategy Types 96	33,3%	33,3%	33,3%	100,0%
Total		Count	9	34	19	62
		% within Strategy Types 96	14,5%	54,8%	30,6%	100,0%

Strategy Types 96 * Automatio ratio for wire cutting equipment

Cross tab

			1 employee for 1 equipment	1 employee for 2 equipment	1 employee for 3 equipment	Total
Strategy Types 96	Defender	Count	4	1		5
		% within Strategy Types 96	80,0%	20,0%		100,0%
	Prospector	Count	10		1	11
		% within Strategy Types 96	90,9%		9,1%	100,0%
	Analyser	Count	8	1		9
		% within Strategy Types 96	88,9%	11,1%		100,0%
	Reactor	Count		1		1
		% within Strategy Types 96		100,0%		100,0%
Total		Count	22	3	1	26
		% within Strategy Types 96	84,6%	11,5%	3,8%	100,0%

Table 5G7 Cont. - Cross-tabulation, strategy types and the technology automation ratio, 1996

Strategy Types 96 * Automatio ratio for laser equipment

Cross tab

			1 employee for 1 equipment	Total
Strategy Types 96	Prospector	Count % within Strategy Types 96	1 100,0%	1 100,0%
	Analyser	Count % within Strategy Types 96	1 100,0%	1 100,0%
Total		Count % within Strategy Types 96	2 100,0%	2 100,0%

Strategy Types 96 * Automatio ratio for quality control equipment

Cross tab

			1 employee for 1 equipment	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	12 100,0%	12 100,0%
	Prospector	Count % within Strategy Types 96	16 100,0%	16 100,0%
	Analyser	Count % within Strategy Types 96	16 100,0%	16 100,0%
Total		Count % within Strategy Types 96	44 100,0%	44 100,0%

Strategy Types 96 * Automatio ratio for test injection equipment

Cross tab

			1 employee for 1 equipment	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	2 100,0%	2 100,0%
	Prospector	Count % within Strategy Types 96	6 100,0%	6 100,0%
	Analyser	Count % within Strategy Types 96	5 100,0%	100,0%
Total		Count % within Strategy Types 96	13 100,0%	13 100,0%

Appendix 5H - Strategy types and firm's size, workforce development and training policy

Table 5H1 - Cross-tabulation, strategy types and the difficulties in workforce recruitment, 1996

Strategy Types 96	Yes	No	Total
Defender	77.8%	22.2%	100.0%
Prospector	81.3%	18.8%	100.0%
Analyser	80.8%	19.2%	100.0%
Reactor	66.7%	33.3%	100.0%
Total	79.4%	20.6%	100.0%

Table 5H2 - Cross-tabulation, strategy types and firm's training policy, 1996

Strategy Types 96	Yes	No	Total
Defender	66,7%	33,3%	100,0%
Prospector	100,0%		100,0%
Analyser	80,8%	19,2%	100,0%
Reactor	66,7%	33,3%	100,0%
Total	81,0%	19,0%	100,0%

Appendix 5I - Strategy types and firm's customers

Table 5I1 - Means, strategy types and the benefits offered to customers, 1980-97

Customer benefits 86

Report
Mean

Strategy Types 86	QUAL 86	DELT 86	PRICE 86	TECH 86	DIFF 86	PSALE 86	INN 86	VAR 86	TRUST 86	CREL 86
Defender	3,29	3,33	3,14	3,10	1,86	3,24	2,71	2,43	4,33	4,57
Prospector	3,73	2,73	2,91	2,91	1,73	3,36	2,82	2,91	4,45	4,36
Analyser	4,08	3,85	3,62	3,46	1,77	3,23	2,23	3,54	4,62	4,69
Reactor	3,00	3,50	3,50	2,75	1,50	2,50	1,75	2,00	3,50	3,50
Total	3,57	3,35	3,24	3,12	1,78	3,20	2,53	2,80	4,37	4,47

Strategy Types 96	QUAL 86	DELT 86	PRICE 86	TECH 86	DIFF 86	PSALE 86	INN 86	VAR 86	TRUST 86	CREL 86
Defender	-0,29	-0,01	-0,10	-0,03	0,08	0,03	0,18	-0,37	-0,03	0,10
Prospector	0,16	-0,62	-0,34	-0,21	-0,05	0,16	0,29	0,11	0,09	-0,11
Analyser	0,51	0,50	0,37	0,34	-0,01	0,03	-0,30	0,74	0,25	0,22
Reactor	-0,57	0,15	0,26	-0,37	-0,28	-0,70	-0,78	-0,80	-0,87	-0,97
Total	0	0	0	0	0	0	0	0	0	0

Customer benefits 92

Report
Mean

Strategy Types 86	QUAL 92	DELT 92	PRICE 92	TECH 92	DIFF 92	PSALE 92	INN 92	VAR 92	TRUST 92	CREL 92
Defender	3,76	3,64	3,16	3,32	1,92	3,56	2,40	2,40	4,52	4,72
Prospector	4,21	3,50	2,93	3,43	1,86	3,43	2,93	3,00	4,57	4,50
Analyser	3,94	3,72	3,56	3,39	2,06	3,22	2,28	3,61	4,44	4,50
Reactor	3,33	3,00	3,67	1,67	1,00	2,00	1,00	1,67	4,67	4,00
Total	3,90	3,60	3,25	3,28	1,90	3,35	2,42	2,87	4,52	4,57

Strategy Types 96	QUAL 92	DELT 92	PRICE 92	TECH 92	DIFF 92	PSALE 92	INN 92	VAR 92	TRUST 92	CREL 92
Defender	-0,14	0,04	-0,09	0,04	0,02	0,21	-0,02	-0,47	0,00	0,15
Prospector	0,31	-0,10	-0,32	0,15	-0,04	0,08	0,51	0,13	0,05	-0,07
Analyser	0,04	0,12	0,31	0,11	0,16	-0,13	-0,14	0,74	-0,07	-0,07
Reactor	-0,57	-0,60	0,42	-1,62	-0,90	-1,35	-1,42	-1,20	0,15	-0,57
Total	0	0	0	0	0	0	0	0	0	0

Table 5I1 Cont. - Means, strategy types and the benefits offered to customers, 1980-97

Customer benefits 95

Report

Mean

Strategy Types 86	QUAL 95	DELT 95	PRICE 95	TECH 95	DIFF 95	PSALE 95	INN 95	VAR 95	TRUST 95	CREL 95
Defender	4,33	3,81	3,14	3,86	1,76	3,67	2,33	2,33	4,62	4,86
Prospector	4,43	3,93	3,07	3,86	2,21	3,93	3,50	3,57	4,71	4,64
Analyser	4,00	3,92	3,17	3,58	2,04	3,38	2,21	3,58	4,54	4,58
Reactor	3,50	3,00	3,50	2,75	1,00	2,75	2,25	2,00	3,50	3,50
Total	4,17	3,83	3,16	3,68	1,92	3,56	2,54	3,06	4,54	4,62

Strategy Types 96	QUAL 95	DELT 95	PRICE 95	TECH 95	DIFF 95	PSALE 95	INN 95	VAR 95	TRUST 95	CREL 95
Defender	0,16	-0,02	-0,02	0,17	-0,16	0,11	-0,21	-0,73	0,08	0,24
Prospector	0,25	0,10	-0,09	0,17	0,29	0,37	0,96	0,51	0,17	0,02
Analyser	-0,17	0,09	0,01	-0,10	0,12	-0,18	-0,33	0,52	0,00	-0,04
Reactor	-0,67	-0,83	0,34	-0,93	-0,92	-0,81	-0,29	-1,06	-1,04	-1,12
Total	0	0	0	0	0	0	0	0	0	0

Customer benefits 96

Report

Mean

Strategy Types 86	QUAL 96	DELT 96	PRICE 96	TECH 96	DIFF 96	PSALE 96	INN 96	VAR 96	TRUST 96	CREL 96
Defender	4,39	4,06	3,22	4,11	1,83	3,72	2,50	2,33	4,72	4,89
Prospector	4,63	4,25	3,13	3,81	2,31	4,06	3,69	3,81	4,81	4,75
Analyser	4,15	3,88	3,12	3,77	2,00	3,54	2,27	3,65	4,69	4,81
Reactor	4,33	2,33	2,67	2,67	1,00	2,67	2,00	2,33	4,00	4,00
Total	4,35	3,95	3,13	3,83	1,98	3,68	2,68	3,25	4,70	4,78

Strategy Types 96	QUAL 96	DELT 96	PRICE 96	TECH 96	DIFF 96	PSALE 96	INN 96	VAR 96	TRUST 96	CREL 96
Defender	0,04	0,10	0,10	0,29	-0,15	0,04	-0,18	-0,92	0,02	0,11
Prospector	0,28	0,30	0,00	-0,01	0,33	0,38	1,00	0,56	0,11	-0,03
Analyser	-0,20	-0,07	-0,01	-0,06	0,02	-0,14	-0,41	0,40	-0,01	0,03
Reactor	-0,02	-1,62	-0,46	-1,16	-0,98	-1,02	-0,68	-0,92	-0,70	-0,78
Total	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 5I1 Cont. - Means, strategy types and the benefits offered to customers, 1980-97

Customer benefits 97

Report
Mean

Strategy Types 86	QUAL 97	DELT 97	PRICE 97	TECH 97	DIFF 97	PSALE 97	INN 97	VAR 97	TRUST 97	CREL 97
Defender	4,35	4,12	3,18	4,18	1,76	3,82	2,59	2,24	4,71	4,88
Prospector	4,64	4,29	3,07	3,93	2,36	4,14	3,71	3,93	4,93	4,79
Analyser	4,34	4,07	3,17	3,97	2,03	3,59	2,45	3,69	4,72	4,83
Reactor	3,00	2,00	2,00	2,00	0,67	1,67	1,67	1,67	3,67	2,67
Total	4,35	4,03	3,10	3,92	1,97	3,68	2,73	3,25	4,71	4,73

Strategy Types 96	QUAL 97	DELT 97	PRICE 97	TECH 97	DIFF 97	PSALE 97	INN 97	VAR 97	TRUST 97	CREL 97
Defender	0,00	0,09	0,08	0,26	-0,20	0,14	-0,14	-1,02	-0,01	0,15
Prospector	0,29	0,25	-0,02	0,01	0,39	0,46	0,98	0,67	0,21	0,06
Analyser	0,00	0,04	0,08	0,04	0,07	-0,10	-0,28	0,44	0,01	0,10
Reactor	-1,35	-2,03	-1,10	-1,92	-1,30	-2,02	-1,06	-1,59	-1,05	-2,06
Total	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Note: In order to emphasise differences between strategies, the total mean was subtracted from the mean of each single strategy type

Table 5I2 - Means, strategy types and the benefits offered to customers; the evolution within each benefit offered, 1980-97

Strategy Types	QUAL 86	QUAL 92	QUAL 95	QUAL 96	QUAL 97
Defender	3,29	3,76	4,33	4,39	4,35
Prospector	3,73	4,21	4,43	4,63	4,64
Analyser	4,08	3,94	4,00	4,15	4,34
Reactor	3,00	3,33	3,50	4,33	3,00
Total	3,57	3,90	4,17	4,35	4,35

Strategy Types	DELT 86	DELT 92	DELT 95	DELT 96	DELT 97
Defender	3,33	3,64	3,81	4,06	4,12
Prospector	2,73	3,50	3,93	4,25	4,29
Analyser	3,85	3,72	3,92	3,88	4,07
Reactor	3,50	3,00	3,00	2,33	2,00
Total	3,35	3,60	3,83	3,95	4,03

Strategy Types	PRICE 86	PRICE 92	PRICE 95	PRICE 96	PRICE 97
Defender	3,14	3,16	3,14	3,22	3,18
Prospector	2,91	2,93	3,07	3,13	3,07
Analyser	3,62	3,56	3,17	3,12	3,17
Reactor	3,50	3,67	3,50	2,67	2,00
Total	3,24	3,25	3,16	3,13	3,10

Strategy Types	TECH 86	TECH 92	TECH 95	TECH 96	TECH 97
Defender	3,10	3,32	3,86	4,11	4,18
Prospector	2,91	3,43	3,86	3,81	3,93
Analyser	3,46	3,39	3,58	3,77	3,97
Reactor	2,75	1,67	2,75	2,67	2,00
Total	3,12	3,28	3,68	3,83	3,92

Strategy Types	DIFF 86	DIFF 92	DIFF 95	DIFF 96	DIFF 97
Defender	1,86	1,92	1,76	1,83	1,76
Prospector	1,73	1,86	2,21	2,31	2,36
Analyser	1,77	2,06	2,04	2,00	2,03
Reactor	1,50	1,00	1,00	1,00	0,67
Total	1,78	1,90	1,92	1,98	1,97

Strategy Types	PSALE 86	PSALE 92	PSALE 95	PSALE 96	PSALE 97
Defender	3,24	3,56	3,67	3,72	3,82
Prospector	3,36	3,43	3,93	4,06	4,14
Analyser	3,23	3,22	3,38	3,54	3,59
Reactor	2,50	2,00	2,75	2,67	1,67
Total	3,20	3,35	3,56	3,68	3,68

Table 5I2 Cont. - Means, strategy types and the benefits offered to customers; the evolution within each benefit offered, 1980-97

Strategy Types	INN 86	INN 92	INN 95	INN 96	INN 97
Defender	2,71	2,40	2,33	2,50	2,59
Prospector	2,82	2,93	3,50	3,69	3,71
Analyser	2,23	2,28	2,21	2,27	2,45
Reactor	1,75	1,00	2,25	2,00	1,67
Total	2,53	2,42	2,54	2,68	2,73

Strategy Types	VAR 86	VAR 92	VAR 95	VAR 96	VAR 97
Defender	2,43	2,40	2,33	2,33	2,24
Prospector	2,91	3,00	3,57	3,81	3,93
Analyser	3,54	3,61	3,58	3,65	3,69
Reactor	2,00	1,67	2,00	2,33	1,67
Total	2,80	2,87	3,06	3,25	3,25

Strategy Types	TRUST 86	TRUST 92	TRUST 95	TRUST 96	TRUST 97
Defender	4,33	4,52	4,62	4,72	4,71
Prospector	4,45	4,57	4,71	4,81	4,93
Analyser	4,62	4,44	4,54	4,69	4,72
Reactor	3,50	4,67	3,50	4,00	3,67
Total	4,37	4,52	4,54	4,70	4,71

Strategy Types	CREL 86	CREL 92	CREL 95	CREL 96	CREL 97
Defender	4,57	4,72	4,86	4,89	4,88
Prospector	4,36	4,50	4,64	4,75	4,79
Analyser	4,69	4,50	4,58	4,81	4,83
Reactor	3,50	4,00	3,50	4,00	2,67
Total	4,47	4,57	4,62	4,78	4,73

Figure 5I2 - Means, strategy types and the benefits offered to customers; the evolution within each benefit offered, 1980-97

Figure 5I2A - Quality, 1980-97

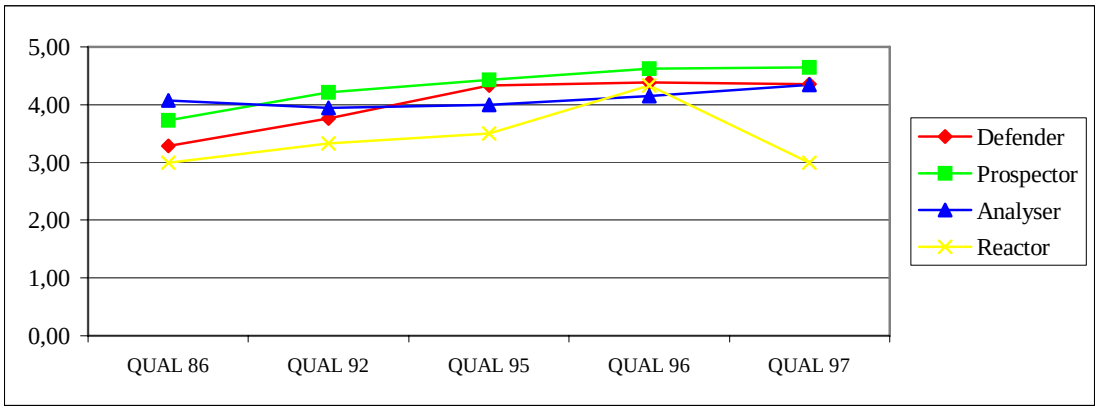


Figure 5I2B - Delivery time, 1980-97

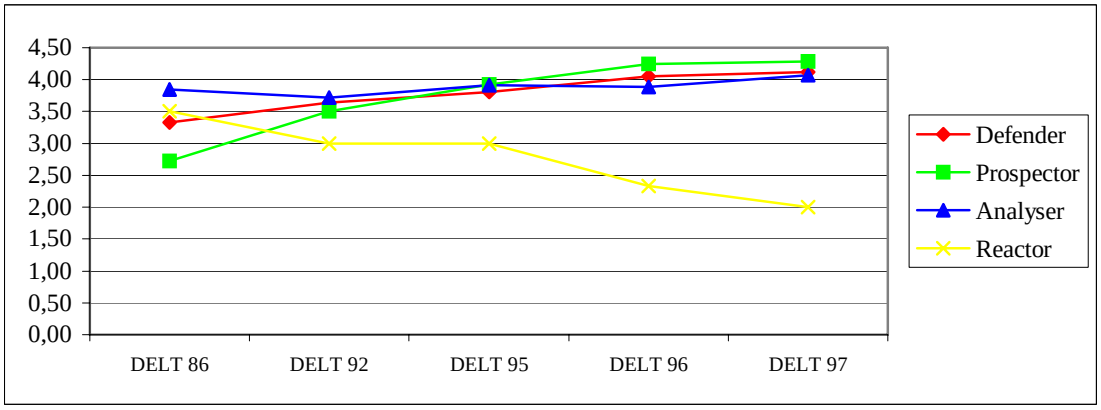


Figure 5I2C - Price, 1980-97

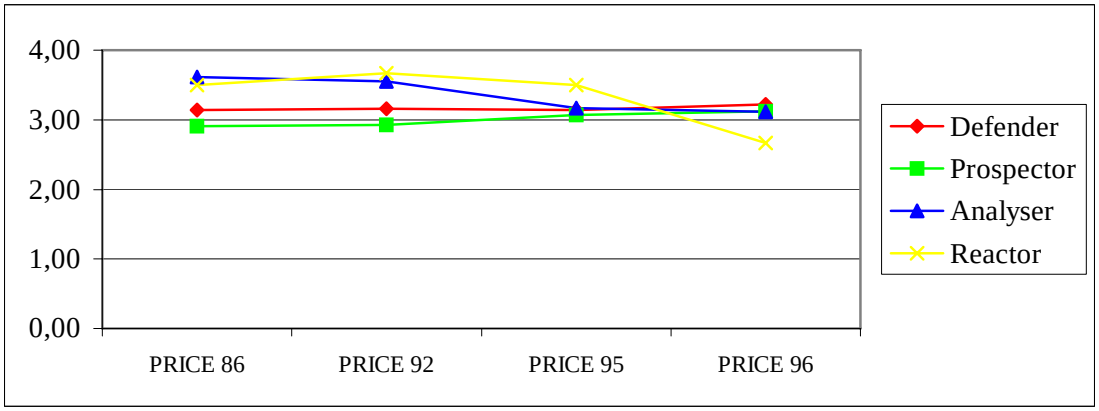


Figure 5I2 Cont. - Means, strategy types and the benefits offered to customers; the evolution within each benefit offered, 1980-97

Figure 5I2D - Technology expertise, 1980-97

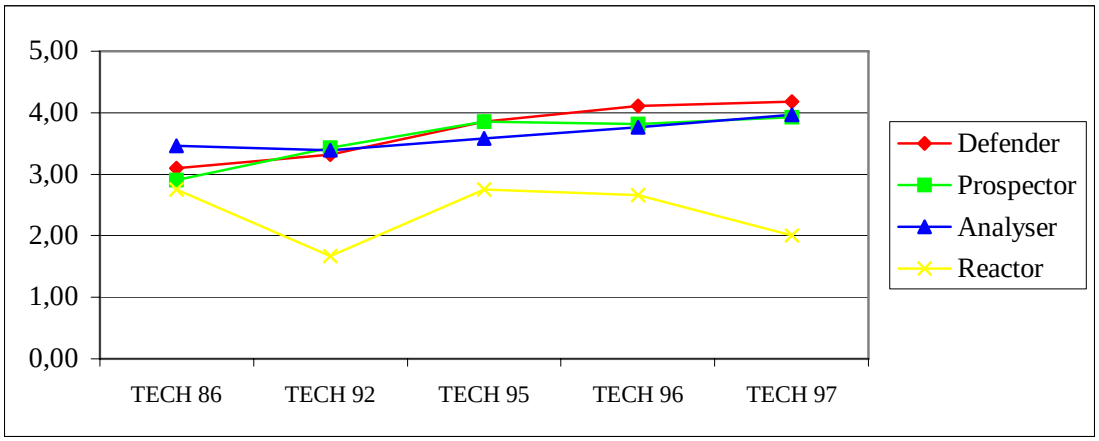


Figure 5I2E - Something different and unique, 1980-97

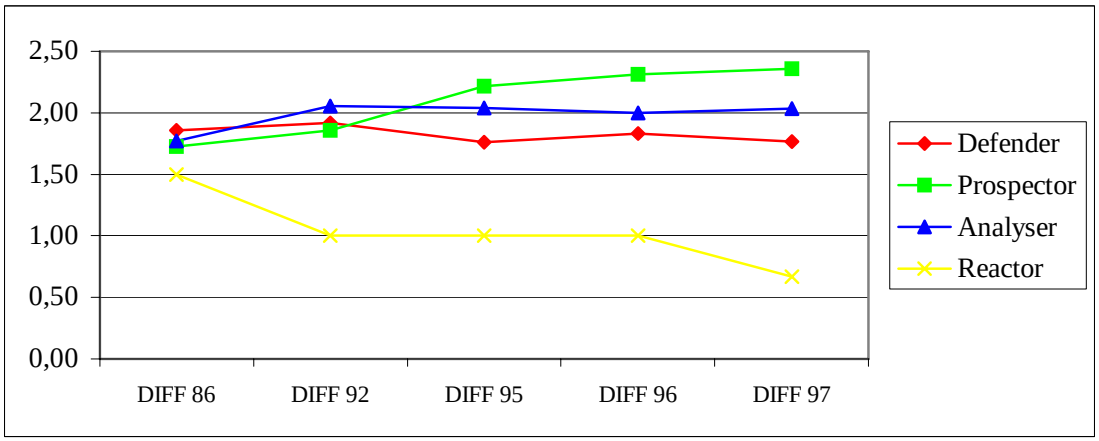


Figure 5I2F - Post sales support, 1980-97

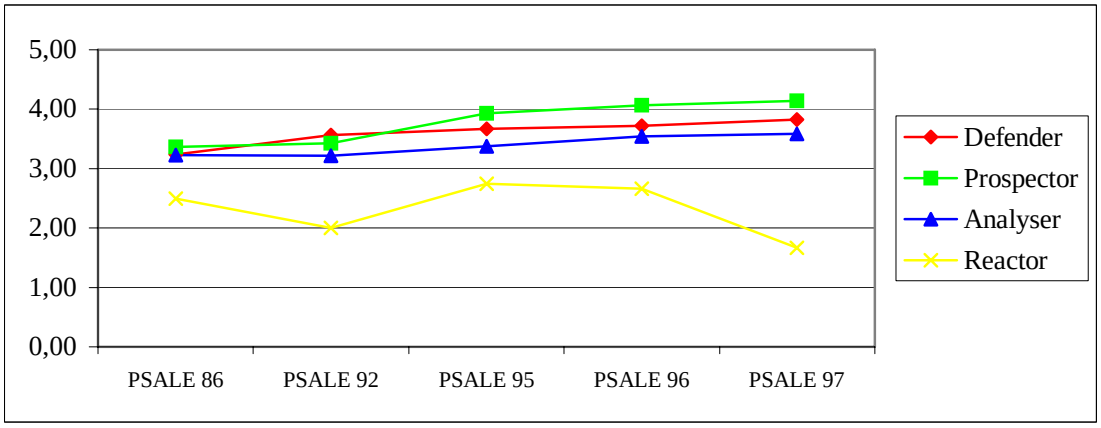


Figure 5I2 Cont. - Means, strategy types and the benefits offered to customers; the evolution within each benefit offered, 1980-97

Figure 5I2G - Innovation, 1980-97

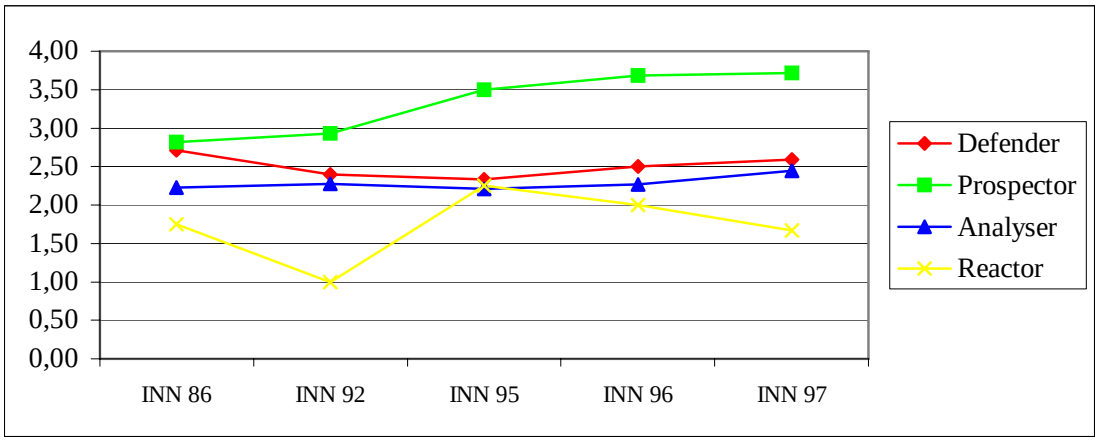


Figure 5I2H - Varied range of services, 1980-97

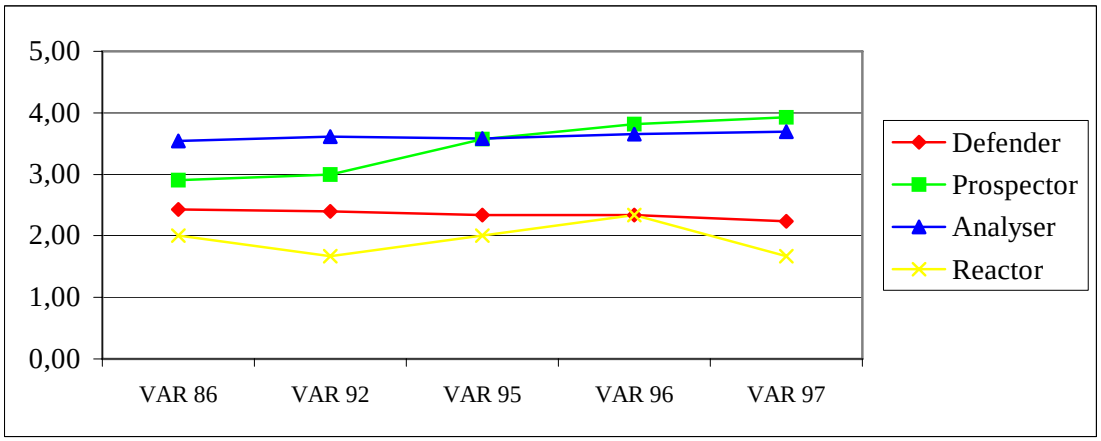


Figure 5I2I - Trust, 1980-97

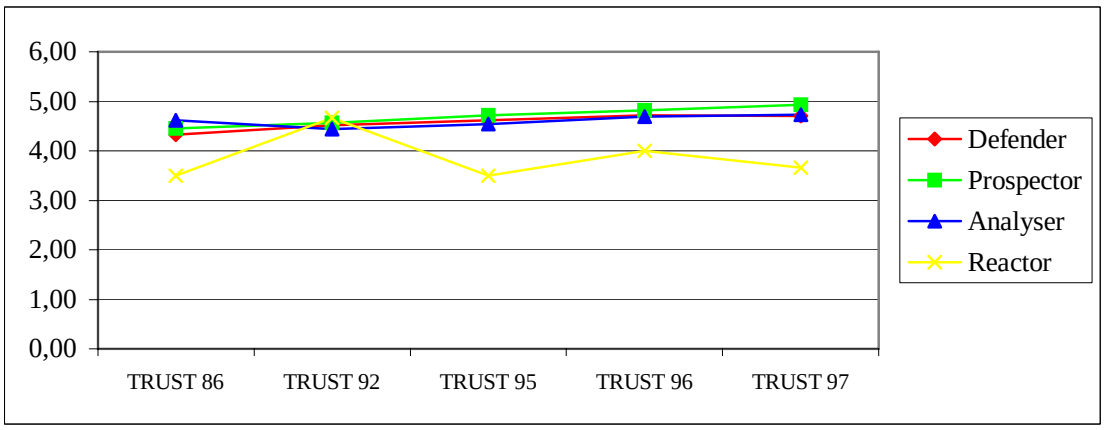
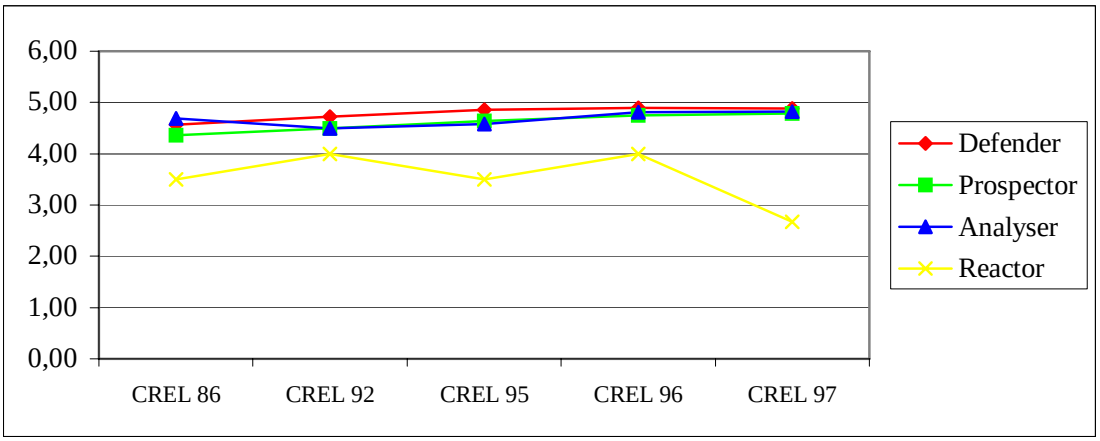


Figure 5I2 Cont. - Means, strategy types and the benefits offered to customers; the evolution within each benefit offered, 1980-97

Figure 5I2J - Customer relationship, 1980-97



Appendix 5J - Strategy types and firm's competition

Table 5J1 - Cross-tabulation, strategy types and the location of competition.

Strategy Types 96 * Competition located at the National market

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	3 16,7%	15 83,3%	18 100,0%
	Prospector	Count % within Strategy Types 96	5 31,3%	11 68,8%	16 100,0%
	Analyser	Count % within Strategy Types 96	8 30,8%	18 69,2%	26 100,0%
	Reactor	Count % within Strategy Types 96		3 100,0%	3 100,0%
Total		Count % within Strategy Types 96	16 25,4%	47 74,6%	63 100,0%

Strategy Types 96 * Competition located at the German market

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	8 44,4%	10 55,6%	18 100,0%
	Prospector	Count % within Strategy Types 96	8 50,0%	8 50,0%	16 100,0%
	Analyser	Count % within Strategy Types 96	14 53,8%	12 46,2%	26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	33 52,4%	30 47,6%	63 100,0%

Table 5J1 Cont. - Cross-tabulation, strategy types and the location of competition

Strategy Types 96 * Competition located at the Italian market

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	7 16,7%	11 83,3%	18 100,0%
	Prospector	Count % within Strategy Types 96	4 25,0%	12 75,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	11 42,3%	15 57,7%	26 100,0%
	Reactor	Count % within Strategy Types 96	2 66,7%	1 33,3%	3 100,0%
Total		Count % within Strategy Types 96	24 38,1%	39 61,9%	63 100,0%

Strategy Types 96 * Competition located at the French market

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	15 83,3%	3 16,7%	18 100,0%
	Prospector	Count % within Strategy Types 96	10 62,5%	6 37,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	24 92,3%	2 7,7%	26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	52 82,5%	11 17,5%	63 100,0%

Strategy Types 96 * Competition located at the British market

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	14 77,8%	4 22,2%	18 100,0%
	Prospector	Count % within Strategy Types 96	16 100,0%		16 100,0%
	Analyser	Count % within Strategy Types 96	24 92,3%	2 7,7%	26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	57 90,5%	6 9,5%	63 100,0%

Table 5J1 Cont. - Cross-tabulation, strategy types and the location of competition.

Strategy Types 96 * Competition located at the Spanish market

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	15 83,3%	3 16,7%	18 100,0%
	Prospector	Count % within Strategy Types 96	14 87,5%	2 12,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	25 96,2%	1 3,8%	26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	57 90,5%	6 9,5%	63 100,0%

Strategy Types 96 * Competition located at the American and the Canadian market

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	16 88,9%	2 11,1%	18 100,0%
	Prospector	Count % within Strategy Types 96	10 62,5%	6 37,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	24 92,3%	2 7,7%	26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	53 84,1%	10 15,9%	63 100,0%

Strategy Types 96 * Competition located at the Far East Asian market

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	9 50,0%	9 50,0%	18 100,0%
	Prospector	Count % within Strategy Types 96	6 37,5%	10 62,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	8 30,8%	18 69,2%	26 100,0%
	Reactor	Count % within Strategy Types 96	2 66,7%	1 33,3%	3 100,0%
Total		Count % within Strategy Types 96	25 39,7%	38 60,3%	63 100,0%

Table 5J1 Cont - Cross-tabulation, strategy types and the location of competition.

Strategy Types 96 * Competition located at the Eastern Europe market

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	14 77,8%	4 22,2%	18 100,0%
	Prospector	Count % within Strategy Types 96	11 68,8%	5 31,3%	16 100,0%
	Analyser	Count % within Strategy Types 96	17 65,4%	9 34,6%	26 100,0%
	Reactor	Count % within Strategy Types 96	2 66,7%	1 33,3%	3 100,0%
Total		Count % within Strategy Types 96	44 69,8%	19 30,2%	63 100,0%

Strategy Types 96 * Competition located at the other markets

Cross tabs

Strategy Types 96			No	Yes	Total
	Defender	Count % within Strategy Types 96	14 77,8%	4 22,2%	18 100,0%
	Prospector	Count % within Strategy Types 96	12 75,0%	4 25,0%	16 100,0%
	Analyser	Count % within Strategy Types 96	23 88,5%	3 11,5%	26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	52 82,5%	11 17,5%	63 100,0%

Appendix 5K - Strategy types and the subcontracting policy

Figure 5K1 - Cross-tabulation, strategy types and firms subcontracting

Strategy Types 96 * Does the organisation subcontract

Cross tabs

Strategy Types 96			Yes	No	Total
	Defender	Count % within Strategy Types 96	18 100,0%		18 100,0%
	Prospector	Count % within Strategy Types 96	16 100,0%		16 100,0%
	Analyser	Count % within Strategy Types 96	26 100,0%		26 100,0%
	Reactor	Count % within Strategy Types 96	2 100,0%		2 100,0%
Total		Count % within Strategy Types 96	62 100,0%		62 100,0%

Figure 5K2 - Means, strategy types and what firms subcontract, 1980-97

1980-86

Report
Mean

Strategy Types 86	Sub. Prod. Definition-product design 86	Sub. Product definition-prototyping 86	Sub. Mould design 86	Sub. CAD/CAM/ CAE 86	Sub. Mould manufacture-Complete mould 86	Sub. Mould manufacture-Parts of the mould 86	Sub. Mould try out 86	Sub. Mould base 86	Sub. Assembling 86
Defender	0,48	0,00	7,14	15,10	4,76	31,67	34,48	5,43	0,00
Prospector	0,00	0,00	10,36	4,18	13,00	27,09	22,27	14,00	0,00
Analyser	3,69	0,00	13,00	0,00	11,00	19,46	36,69	13,08	0,00
Reactor	0,00	0,00	29,25	5,00	12,50	30,25	20,50	2,50	0,00
Total	1,18	0,00	11,22	7,82	8,90	27,29	31,18	9,14	0,00

1987-92

Report
Mean

Strategy Types 92	Sub. Product definition-product design 92	Sub. Product definition-prototyping 92	Sub. Mould design 92	Sub. CAD/CAM/ CAE 92	Sub. Mould manufacture-Complete mould 92	Sub. Mould manufacture-Parts of the mould 92	Sub. Mould try out 92	Sub. Mould base 92	Sub. Assembling 92
Defender	1,64	1,00	6,88	7,00	4,64	34,84	29,60	13,08	0,80
Prospector	0,00	0,00	9,43	10,79	12,07	19,29	22,79	21,36	0,00
Analyser	1,72	0,56	10,50	2,67	13,11	20,39	32,11	11,22	0,61
Reactor	0,00	0,00	30,00	6,67	0,00	6,67	23,33	0,00	0,00
Total	1,20	0,58	9,72	6,57	8,68	25,47	28,45	13,80	0,52

1993-95

Report
Mean

Strategy Types 95	Sub. Produc definition-product design 95	Sub. Product definition-prototyping 95	Sub. Mould design 95	Sub. CAD/CAM/ CAE 95	Sub. Mould manufacture-Complete mould 95	Sub. Mould manufacture-Parts of the mould 95	Sub. Mould try out 95	Sub. Mould base 95	Sub. Assembling 95
Defender	2,62	2,38	8,71	9,62	7,76	29,43	25,95	13,52	0,10
Prospector	0,71	0,14	7,57	8,93	15,57	22,36	29,36	12,64	0,36
Analyser	1,71	0,75	12,13	3,63	11,71	20,17	27,17	17,75	0,46
Reactor	0,00	0,00	20,00	20,00	7,50	13,75	28,25	10,50	0,00
Total	1,68	1,11	10,48	7,84	10,98	23,33	27,32	14,75	0,29

Figure 5K2 Cont. - Means, strategy types and what firms subcontract, 1980-97

1996

Report
Mean

Strategy Types 92	Sub. Product definition-product design 92	Sub. Product definition-prototyping 92	Sub. Mould design 92	Sub. CAD/CAM/ CAE 92	Sub. Mould manufacture-Complete mould 92	Sub. Mould manufacture-Parts of the mould 92	Sub. Mould try out 92	Sub. Mould base 92	Sub. Assembling 92
Defender	3,06	2,78	8,17	7,89	3,83	31,89	26,39	16,56	0,50
Prospector	0,63	1,06	11,44	8,06	20,69	21,44	22,81	9,44	0,94
Analyser	2,54	0,63	10,58	3,54	13,10	22,73	26,83	13,10	0,23
Reactor	0,00	0,00	20,00	26,67	0,00	3,33	10,00	6,67	0,00
Total	2,08	1,33	10,56	7,03	11,75	24,10	24,88	12,85	0,48

1997

Report
Mean

Strategy Types 92	Sub. Product definition-product design 92	Sub. Product definition-prototyping 92	Sub. Mould design 92	Sub. CAD/CAM/ CAE 92	Sub. Mould manufacture-Complete mould 92	Sub. Mould manufacture-Parts of the mould 92	Sub. Mould try out 92	Sub. Mould base 92	Sub. Assembling 92
Defender	3,35	2,94	9,65	6,65	2,82	33,82	21,82	16,94	0,53
Prospector	0,71	1,21	7,36	5,50	18,79	23,14	24,21	12,43	1,43
Analyser	2,03	0,45	11,72	5,00	15,28	20,83	24,83	15,31	0,21
Reactor	0,00	0,00	20,00	26,67	0,00	3,33	10,00	6,67	0,00
Total	2,00	1,27	10,59	6,59	11,97	24,02	23,17	14,70	0,56

Table 5K3 - Means, strategy types and what firms subcontract; the evolution within each activity subcontracted, 1980-97

Strategy Types	Product definition-product design 86	Product definition-product design 92	Product definition-product design 95	Product definition-product design 96	Product definition-product design 97
Defender	0,48	1,64	2,62	3,06	3,35
Prospector	0,00	0,00	0,71	0,63	0,71
Analyser	3,69	1,72	1,71	2,54	2,03
Reactor	0,00	0,00	0,00	0,00	0,00
Total	1,18	1,20	1,68	2,08	2,00

Strategy Types	Product definition-prototyping 86	Product definition-prototyping 92	Product definition-prototyping 95	Product definition-prototyping 96	Product definition-prototyping 97
Defender	0,00	1,00	2,38	2,78	2,94
Prospector	0,00	0,00	0,14	1,06	1,21
Analyser	0,00	0,56	0,75	0,63	0,45
Reactor	0,00	0,00	0,00	0,00	0,00
Total	0,00	0,58	1,11	1,33	1,27

Strategy Types	Mould design 86	Mould design 92	Mould design 95	Mould design 96	Mould design 97
Defender	7,14	6,88	8,71	8,17	9,65
Prospector	10,36	9,43	7,57	11,44	7,36
Analyser	13,00	10,50	12,13	10,58	11,72
Reactor	29,25	30,00	20,00	20,00	20,00
Total	11,22	9,72	10,48	10,56	10,59

Strategy Types	CAD/CAM/CAE 86	CAD/CAM/CAE 92	CAD/CAM/CAE 95	CAD/CAM/CAE 96	CAD/CAM/CAE 97
Defender	15,10	7,00	9,62	7,89	6,65
Prospector	4,18	10,79	8,93	8,06	5,50
Analyser	0,00	2,67	3,63	3,54	5,00
Reactor	5,00	6,67	20,00	26,67	26,67
Total	7,82	6,57	7,84	7,03	6,59

Strategy Types	Mould manufacture-Complete mould 86	Mould manufacture-Complete mould 92	Mould manufacture-Complete mould 95	Mould manufacture-Complete mould 96	Mould manufacture-Complete mould 97
Defender	4,76	4,64	7,76	3,83	2,82
Prospector	13,00	12,07	15,57	20,69	18,79
Analyser	11,00	13,11	11,71	13,10	15,28
Reactor	12,50	0,00	7,50	0,00	0,00
Total	8,90	8,68	10,98	11,75	11,97

Cont. Table 5K3 - Means, Strategic differences between what firms subcontract; the evolution within each activity subcontracted, 1980-97

Strategy Types	Mould manufacture-Parts of the mould 86	Mould manufacture-Parts of the mould 92	Mould manufacture-Parts of the mould 95	Mould manufacture-Parts of the mould 96	Mould manufacture-Parts of the mould 97
Defender	31,67	34,84	29,43	31,89	33,82
Prospector	27,09	19,29	22,36	21,44	23,14
Analyser	19,46	20,39	20,17	22,73	20,83
Reactor	30,25	6,67	13,75	3,33	3,33
Total	27,29	25,47	23,33	24,10	24,02

Strategy Types	Mould try out 86	Mould try out 92	Mould try out 95	Mould try out 96	Mould try out 97
Defender	34,48	29,60	25,95	26,39	21,82
Prospector	22,27	22,79	29,36	22,81	24,21
Analyser	36,69	32,11	27,17	26,83	24,83
Reactor	20,50	23,33	28,25	10,00	10,00
Total	31,18	28,45	27,32	24,88	23,17

Strategy Types	Mould base 86	Mould base 92	Mould base 95	Mould base 96	Mould base 97
Defender	5,43	13,08	13,52	16,56	16,94
Prospector	14,00	21,36	12,64	9,44	12,43
Analyser	13,08	11,22	17,75	13,10	15,31
Reactor	2,50	0,00	10,50	6,67	6,67
Total	9,14	13,80	14,75	12,85	14,70

Strategy Types	Assembling 86	Assembling 92	Assembling 95	Assembling 96	Assembling 97
Defender	0,00	0,80	0,10	0,50	0,53
Prospector	0,00	0,00	0,36	0,94	1,43
Analyser	0,00	0,61	0,46	0,23	0,21
Reactor	0,00	0,00	0,00	0,00	0,00
Total	0,00	0,52	0,29	0,48	0,56

Figure 5K3 - Means, strategy types and what firms subcontract; the evolution within each activity subcontracted, 1980-97

Figure 5K3A - Product definition-product design, 1980-97

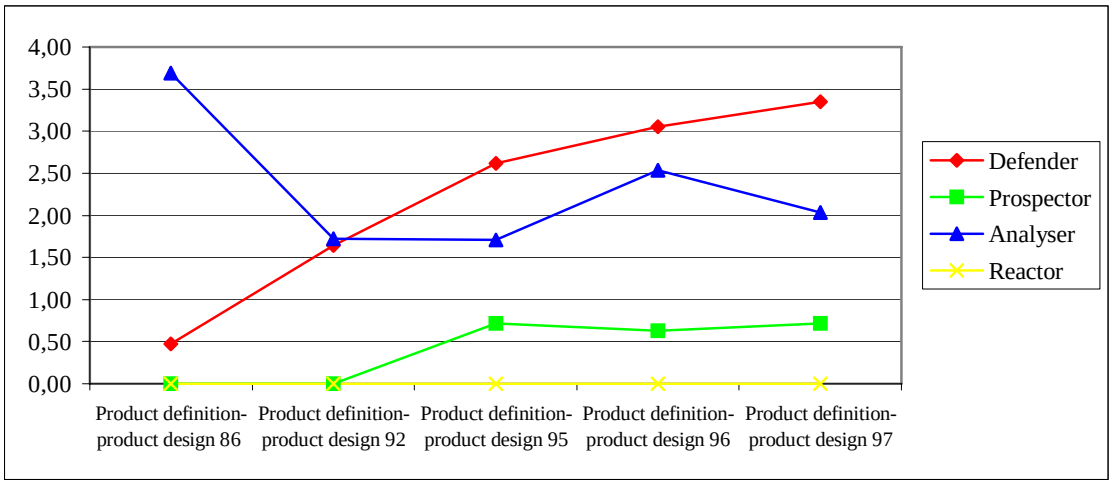


Figure 5K3B - Product definition-prototyping, 1980-97

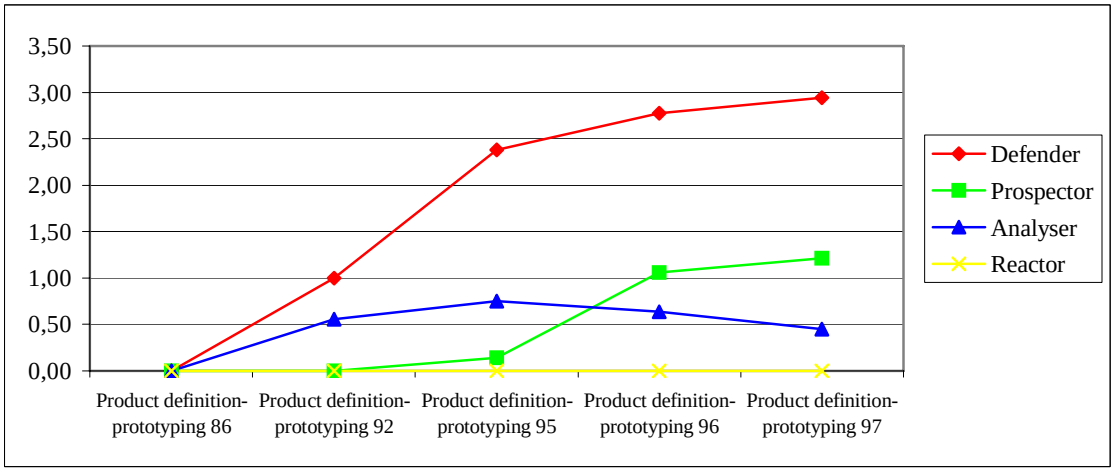


Figure 5K3C - Mould design, 1980-97

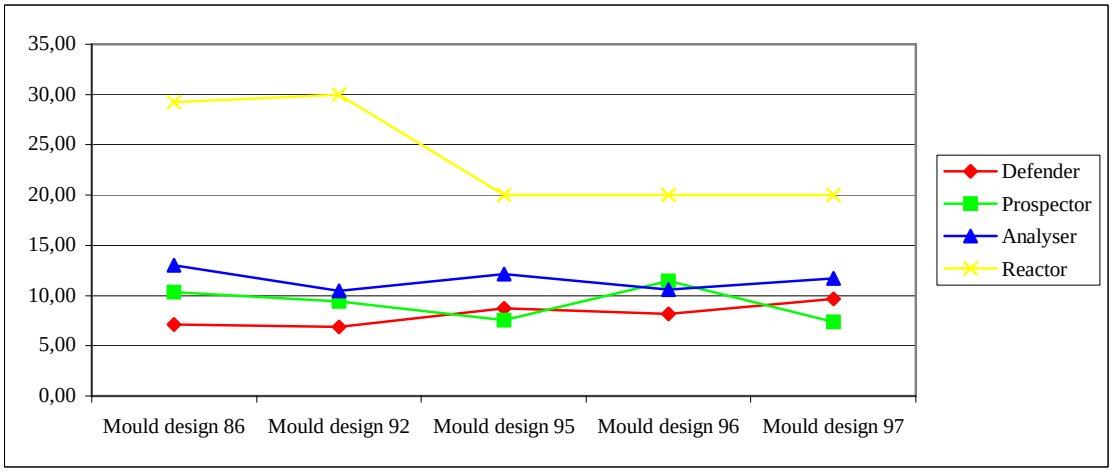


Figure 5K3 Cont.- Means, strategy types and what firms subcontract; the evolution within each activity subcontracted, 1980-97

Figure 5K3D - CAD/CAM/CAE, 1980-97

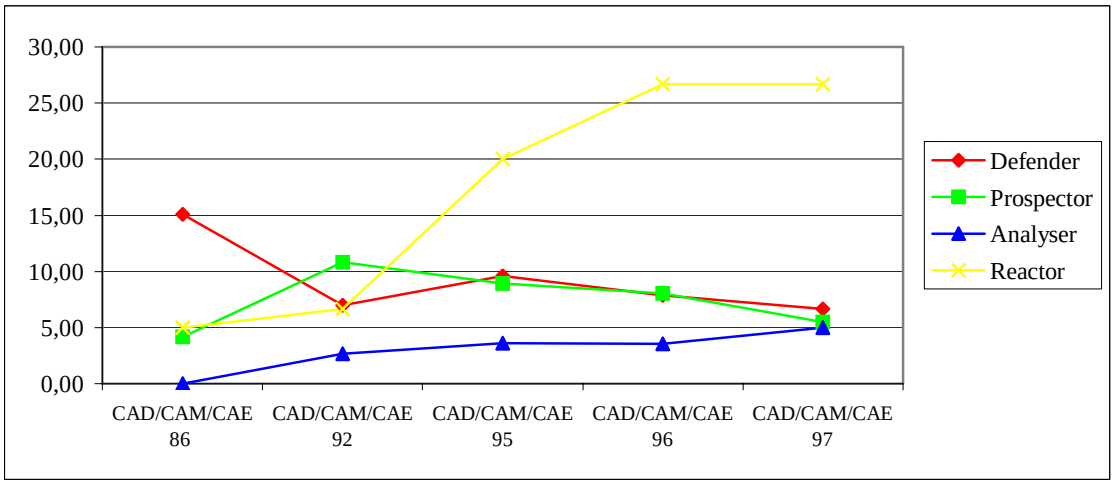


Figure 5K3E - Mould manufactured - Complete mould, 1980-97

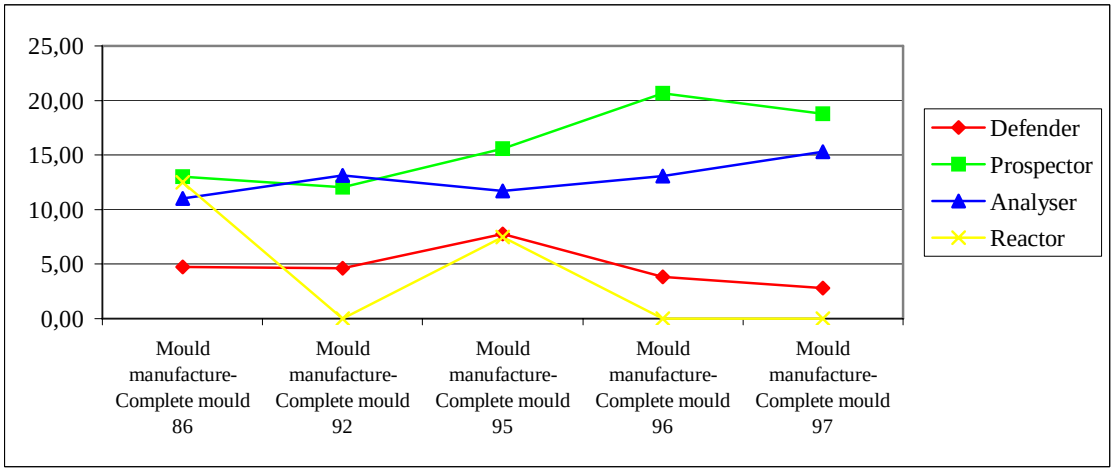


Figure 5K3F - Mould manufactured - Parts of the mould, 1980-97

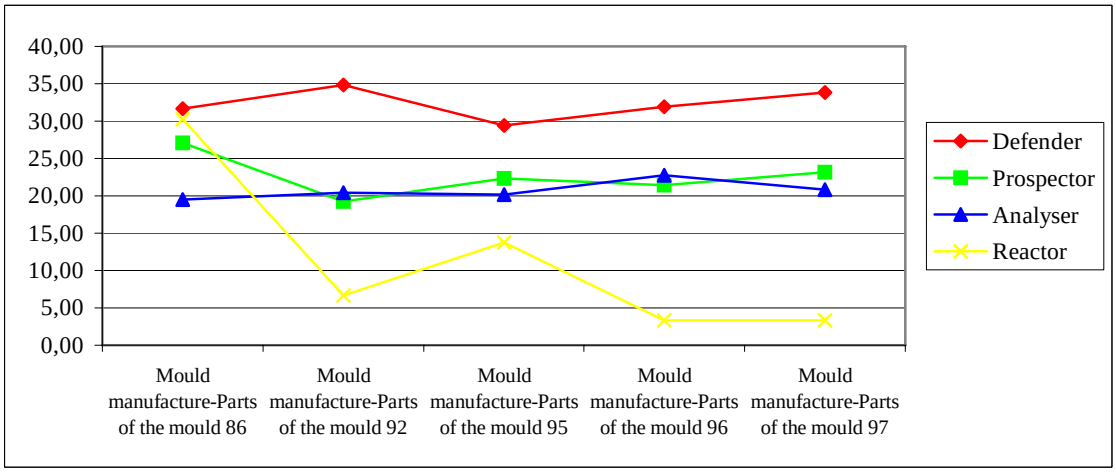


Figure 5K3 Cont - Means, strategy types and what firms subcontract; the evolution within each activity subcontracted, 1980-97

Figure 5K3G - Mould try out, 1980-97

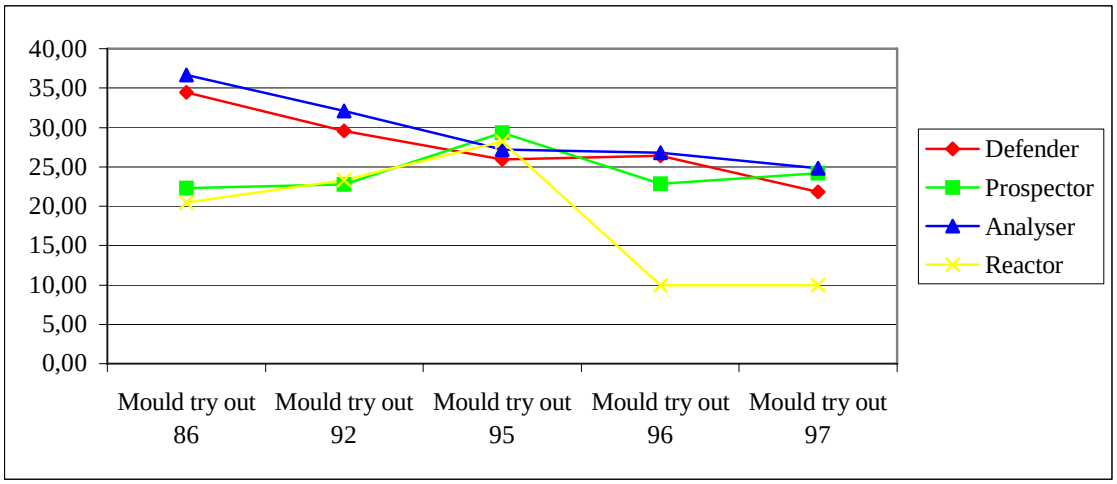


Figure 5K3H - Mould base, 1980-97

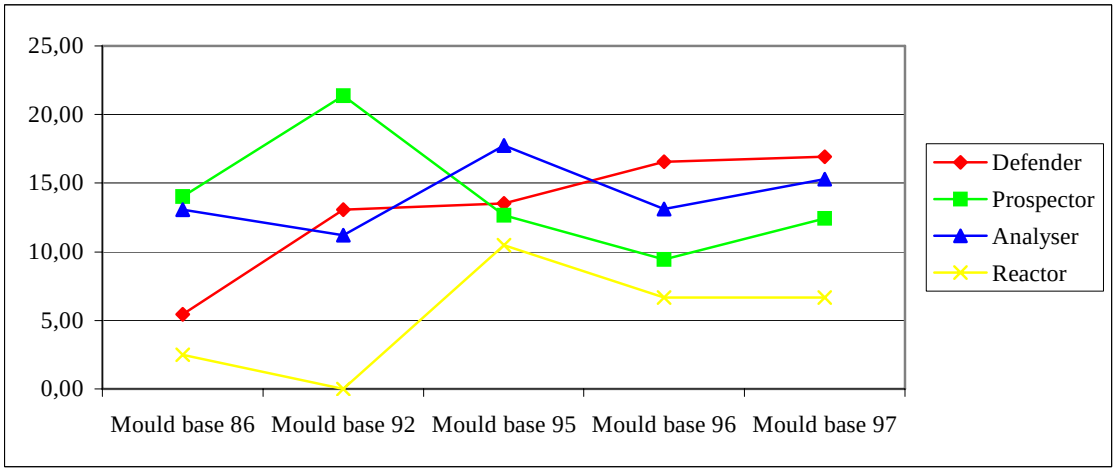


Figure 5K3I - Assembling, 1980-97

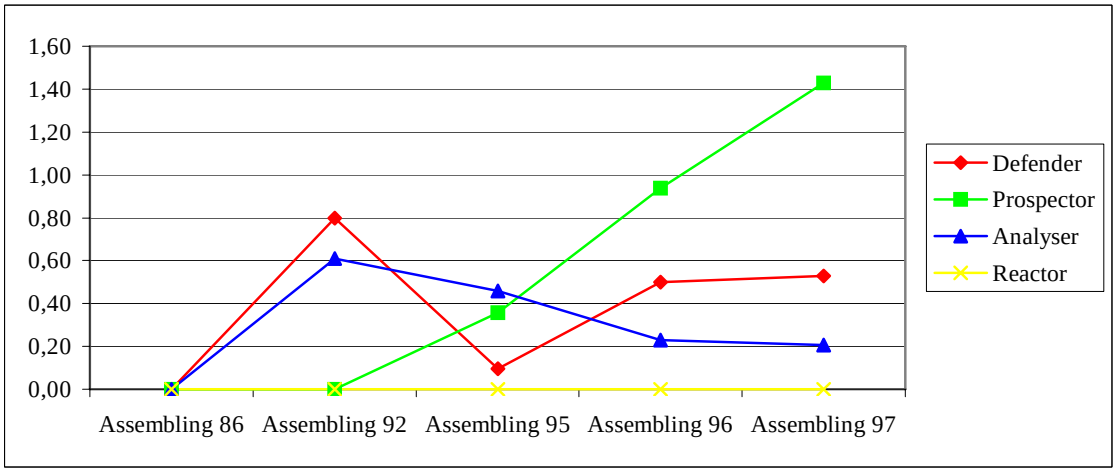


Table 5K4 - Means, subcontract of each strategy type across the timescales, 1980-97

Defender 1980-96

Strategy Types	Product definition-product design	Product definition-prototyping	Mould design	CAD/CAM/CAE	Mould manufacture-Complete mould	Mould manufacture-Parts of the mould	Mould try out	Mould base	Assembling
Defender 86	0,48	0,00	7,14	15,10	4,76	31,67	34,48	5,43	0,00
Defender 92	1,64	1,00	6,88	7,00	4,64	34,84	29,60	13,08	0,80
Defender 95	2,62	2,38	8,71	9,62	7,76	29,43	25,95	13,52	0,10
Defender 96	3,06	2,78	8,17	7,89	3,83	31,89	26,39	16,56	0,50
Defender 97	3,35	2,94	9,65	6,65	2,82	33,82	21,82	16,94	0,53

Prospector 1980-96

Strategy Types	Product definition-product design	Product definition-prototyping	Mould design	CAD/CAM/CAE	Mould manufacture-Complete mould	Mould manufacture-Parts of the mould	Mould try out	Mould base	Assembling
Prospector 86	0,0	0,0	10,4	4,2	13,0	32,1	22,3	14,0	0,0
Prospector 92	0,0	0,0	9,4	10,8	12,1	27,2	22,8	21,4	0,0
Prospector 95	0,7	0,1	7,6	8,9	15,6	26,8	29,4	12,6	0,4
Prospector 96	0,6	1,1	11,4	8,1	20,7	24,8	22,8	9,4	0,9
Prospector 97	0,7	1,2	7,4	5,5	18,8	0,0	24,2	12,4	1,4

Analyser 1980-96

Strategy Types	Product definition-product design	Product definition-prototyping	Mould design	CAD/CAM/CAE	Mould manufacture-Complete mould	Mould manufacture-Parts of the mould	Mould try out	Mould base	Assembling
Analyser 86	3,7	0,0	13,0	0,0	11,0	0,0	36,7	13,1	0,0
Analyser 92	1,7	0,6	10,5	2,7	13,1	0,0	32,1	11,2	0,6
Analyser 95	1,7	0,8	12,1	3,6	11,7	0,0	27,2	17,8	0,5
Analyser 96	2,5	0,6	10,6	3,5	13,1	0,0	26,8	13,1	0,2
Analyser 97	2,0	0,4	11,7	5,0	15,3	0,0	24,8	15,3	0,2

Reactor 1980-96

Strategy Types	Product definition-product design	Product definition-prototyping	Mould design	CAD/CAM/CAE	Mould manufacture-Complete mould	Mould manufacture-Parts of the mould	Mould try out	Mould base	Assembling
Reactor 86	0,0	0,0	29,3	5,0	12,5	0,0	20,5	2,5	0,0
Reactor 92	0,0	0,0	30,0	6,7	0,0	0,0	23,3	0,0	0,0
Reactor 95	0,0	0,0	20,0	20,0	7,5	0,0	28,3	10,5	0,0
Reactor 96	0,0	0,0	20,0	26,7	0,0	0,0	10,0	6,7	0,0
Reactor 97	0,0	0,0	20,0	26,7	0,0	0,0	10,0	6,7	0,0

Figure 5K4 - Means, subcontract of each strategy type across the timescales, 1980-97

Figure 5KA - Defenders, 1980-97

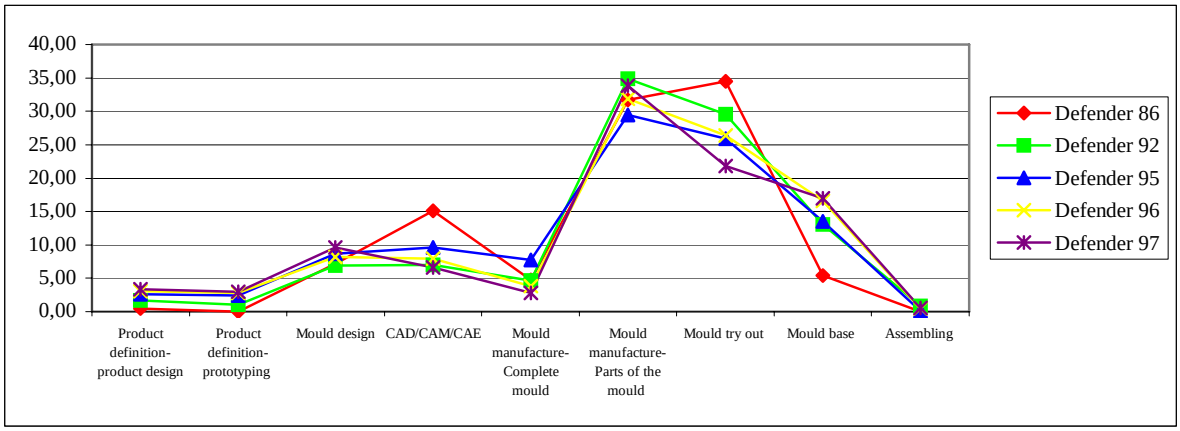


Figure 5KB - Prospectors, 1980-97

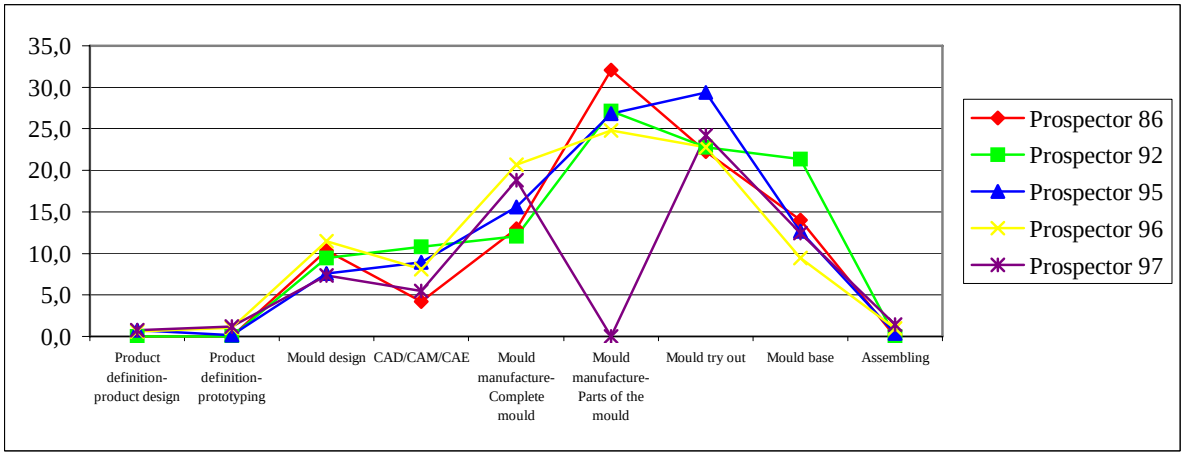


Figure 5KC - Analysers, 1980-97

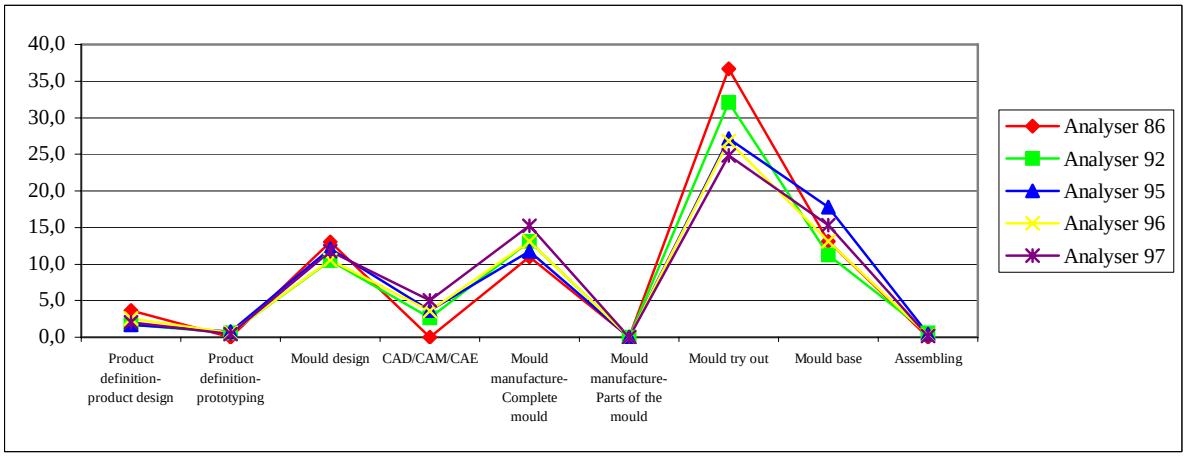
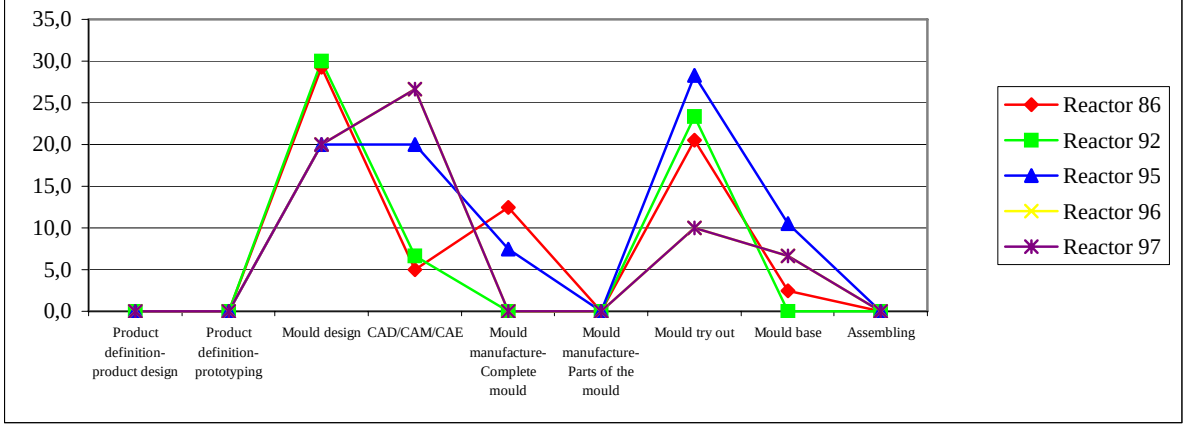


Figure 5K4 Cont. - Means, subcontract of each strategy type across the timescales, 1980-97

Figure 5KD - Reactors, 1980-97



Appendix 5L - Strategy types and firms' environmental opportunities and threats

Table 5L1 - Cross-tabulation, strategy types and the identification of firm's opportunities and threats, 1996

Strategy Types 96 * European Eastern countries

Cross tab

			Opportunity	Threat	Not applicable	Total
Strategy Types 96	Defender	Count	4	10	4	18
		% within Strategy Types 96	22,2%	55,6%	22,2%	100,0%
	Prospector	Count	3	12	1	16
		% within Strategy Types 96	18,8%	75,0%	6,3%	100,0%
	Analyser	Count	4	16	6	26
		% within Strategy Types 96	15,4%	61,5%	23,1%	100,0%
	Reactor	Count	1	1	1	3
		% within Strategy Types 96	33,3%	33,3%	33,3%	100,0%
Total		Count	12	39	12	63
		% within Strategy Types 96	19,0%	61,9%	19,%	100,0%

Strategy Types 96 * Maturity of some markets

Cross tab

			Opportunity	Threat	Not applicable	Total
Strategy Types 96	Defender	Count		7	11	18
		% within Strategy Types 96		38,9%	61,1%	100,0%
	Prospector	Count	3	5	8	16
		% within Strategy Types 96	18,8%	31,3%	50,0%	100,0%
	Analyser	Count	1	9	16	26
		% within Strategy Types 96	3,8%	34,6%	61,5%	100,0%
	Reactor	Count		2	1	3
		% within Strategy Types 96		66,7%	33,3%	100,0%
Total		Count	4	23	36	63
		% within Strategy Types 96	6,3%	36,5%	57,1%	100,0%

Strategy Types 96 * New markets

Cross tab

			Opportunity	Threat	Not applicable	Total
Strategy Types 96	Defender	Count	16		2	18
		% within Strategy Types 96	88,9%		11,1%	100,0%
	Prospector	Count	14		2	16
		% within Strategy Types 96	87,5%		12,5%	100,0%
	Analyser	Count	21	1	4	26
		% within Strategy Types 96	80,8%	3,8%	15,4%	100,0%
	Reactor	Count	2	1		3
		% within Strategy Types 96	66,7%	33,3%		100,0%
Total		Count	53	2	8	63
		% within Strategy Types 96	84,1%	3,2%	12,7%	100,0%

Table 5L1 Cont. - Cross-tabulation, strategy types and the identification of firm's opportunities and threats, 1996

Strategy Types 96 * Political uncertainties

Cross tab

			Threat	Not applicable	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	7 38,9%	11 61,1%	18 100,0%
	Prospector	Count % within Strategy Types 96	4 25,0%	12 75,0%	16 100,0%
	Analyser	Count % within Strategy Types 96	5 19,2%	21 80,8%	26 100,0%
	Reactor	Count % within Strategy Types 96	1 33,3%	2 66,7%	3 100,0%
Total		Count % within Strategy Types 96	17 27,0%	46 73,0%	63 100,0%

Strategy Types 96 * International economic crisis

Cross tab

			Threat	Not applicable	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	12 66,7%	6 33,3%	18 100,0%
	Prospector	Count % within Strategy Types 96	10 62,5%	6 37,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	24 92,3%	2 7,7%	26 100,0%
	Reactor	Count % within Strategy Types 96	3 100,0%		3 100,0%
Total		Count % within Strategy Types 96	49 77,8%	14 22,2%	63 100,0%

Strategy Types 96 * Intermediaries-trade firms

Cross tab

			Opportunity	Threat	Not applicable	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	3 16,7%	12 66,7%	3 16,7%	18 100,0%
	Prospector	Count % within Strategy Types 96	1 6,3%	9 56,3%	6 37,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	6 23,1%	15 57,7%	5 19,2%	26 100,0%
	Reactor	Count % within Strategy Types 96	1 33,3%	2 66,7%		3 100,0%
Total		Count % within Strategy Types 96	11 17,5%	38 60,3%	14 22,2%	63 100,0%

Table 5L1 Cont. - Cross-tabulation, strategy types and the identification of firm's opportunities and threats, 1996

Strategy Types 96 * Legislation

Cross tab

			Threat	Not applicable	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	3 16,7%	15 83,3%	18 100,0%
	Prospector	Count % within Strategy Types 96	2 12,5%	14 87,5%	16 100,0%
	Analyser	Count % within Strategy Types 96	9 34,6%	17 65,4%	26 100,0%
	Reactor	Count % within Strategy Types 96	2 66,7%	1 33,3%	3 100,0%
Total		Count % within Strategy Types 96	16 25,4%	47 74,6%	63 100,0%

Strategy Types 96 * Bureaucracy

Cross tab

			Threat	Not applicable	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	11 61,1%	7 38,9%	18 100,0%
	Prospector	Count % within Strategy Types 96	7 43,8%	9 56,3%	16 100,0%
	Analyser	Count % within Strategy Types 96	16 61,5%	10 38,5%	26 100,0%
	Reactor	Count % within Strategy Types 96	2 66,7%	1 33,3%	3 100,0%
Total		Count % within Strategy Types 96	36 57,1%	27 42,9%	63 100,0%

Strategy Types 96 * Government support

Cross tab

			Opportunity	Threat	Not applicable	Total
Strategy Types 96	Defender	Count % within Strategy Types 96	2 11,1%	2 11,1%	14 77,8%	18 100,0%
	Prospector	Count % within Strategy Types 96	9 56,3%		7 43,8%	16 100,0%
	Analyser	Count % within Strategy Types 96	6 23,1%	2 7,7%	18 69,2%	26 100,0%
	Reactor	Count % within Strategy Types 96			3 100,0%	3 100,0%
Total		Count % within Strategy Types 96	17 27,0%	4 6,3%	42 66,7%	63 100,0%

Table 5L1 Cont. - Cross-tabulation, strategy types and the identification of firm's opportunities and threats, 1996

Strategy Types 96 * The image of the Portuguese mould makers

Cross tab

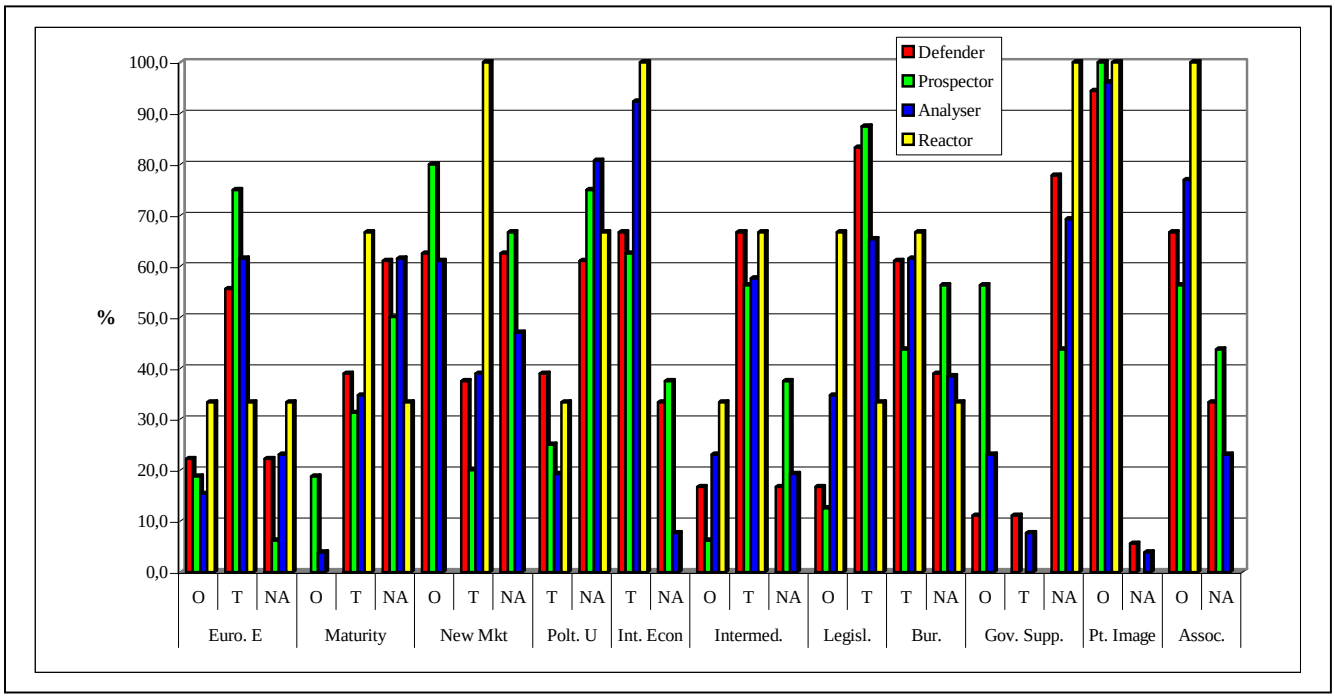
			Opportunity	Not applicable	Total
Strategy Types 96	Defender	Count	17	1	18
		% within Strategy Types 96	94,4%	5,6%	100,0%
	Prospector	Count	16		16
		% within Strategy Types 96	100,0%		100,0%
	Analyser	Count	25	1	26
		% within Strategy Types 96	96,2%	3,8%	100,0%
	Reactor	Count	3		3
		% within Strategy Types 96	100,0%		100,0%
Total		Count	61	2	63
		% within Strategy Types 96	96,8%	3,2%	100,0%

Strategy Types 96 * Associateship

Cross tab

			Opportunity	Not applicable	Total
Strategy Types 96	Defender	Count	12	6	18
		% within Strategy Types 96	66,7%	33,3%	100,0%
	Prospector	Count	9	7	16
		% within Strategy Types 96	56,3%	43,8%	100,0%
	Analyser	Count	20	6	26
		% within Strategy Types 96	76,9%	23,1%	100,0%
	Reactor	Count	3		3
		% within Strategy Types 96	100,0%		100,0%
Total		Count	44	19	63
		% within Strategy Types 96	69,8%	30,2%	100,0%

Figure 5L1 - Cross-tabulation, strategy types and the identification of firm's opportunities and threats, 1996



Appendix 5M - Strategy types and organisational performance

Table 5M1 - Means, strategy types and the organisational performance ratios, 1980-96

Report
Mean

Strategy Types 86	Profit margin 86	Return on equity (ROE) 86	Return on assets (ROA) 86	Return on sales (ROS) 86	Sales growth 86	Sales/moulds 86
Defender	5,97	23,47	6,49	210,22	417,44	2.217,45
Prospector	3,00	18,35	2,32	140,33	163,55	2.423,91
Analyser	5,32	31,41	5,37	116,77	163,38	2.259,05
Reactor	9,18	39,55	18,24	81,91	306,48	1.139,61
Total	5,24	25,90	5,95	150,62	261,64	2.222,30
Std. Deviation	4,81	34,24	8,31	187,83	510,77	1.387,10

Strategy Types 86	Profit margin 86	Return on equity (ROE) 86	Return on assets (ROA) 86	Return on sales (ROS) 86	Sales growth 86	Sales/moulds 86
Defender	0,15	-0,07	0,07	0,32	0,31	0,00
Prospector	-0,46	-0,22	-0,44	-0,05	-0,19	0,15
Analyser	0,02	0,16	-0,07	-0,18	-0,19	0,03
Reactor	0,82	0,40	1,48	-0,37	0,09	-0,78

Report
Mean

Strategy Types 92	Profit margin 92	Return on equity (ROE) 92	Return on assets (ROA) 92	Return on sales (ROS) 92	Sales growth 92	Sales/moulds 92
Defender	0,15	7,00	1,36	118,47	100,93	4.549,17
Prospector	-0,17	-24,84	-26,32	123,29	38,65	5.408,43
Analyser	-0,03	-4,54	1,18	91,65	83,31	4.169,80
Reactor	3,01	11,49	2,50	120,06	139,42	5.335,62
Total	0,12	-4,72	-5,83	111,33	80,66	4.669,30
Std. Deviation	5,65	61,57	52,09	67,40	100,09	2.315,22

Strategy Types 92	Profit margin 92	Return on equity (ROE) 92	Return on assets (ROA) 92	Return on sales (ROS) 92	Sales growth 92	Sales/moulds 92
Defender	0,01	0,19	0,14	0,11	0,20	-0,05
Prospector	-0,05	-0,33	-0,39	0,18	-0,42	0,32
Analyser	-0,03	0,00	0,13	-0,29	0,03	-0,22
Reactor	0,51	0,26	0,16	0,13	0,59	0,29

Table 5M1 Cont. - Means, strategy types and the organisational performance ratios, 1980-96

Report
Mean

Strategy Types 95	Profit margin 95	Return on equity (ROE) 95	Return on assets (ROA) 95	Return on sales (ROS) 95	Sales growth 95	Sales/moulds 95
Defender	-0,36	1,40	1,28	105,62	31,54	5.649,29
Prospector	1,33	73,29	70,15	107,14	36,86	8.304,75
Analyser	1,15	12,86	1,61	99,82	32,02	5.778,73
Reactor	1,43	7,61	1,71	398,93	505,68	3.657,67
Total	0,73	22,75	17,14	119,07	57,90	6.209,90
Std. Deviation	3,83	121,38	119,07	132,08	190,87	4.269,27

Strategy Types 95	Profit margin 95	Return on equity (ROE) 95	Return on assets (ROA) 95	Return on sales (ROS) 95	Sales growth 95	Sales/moulds 95
Defender	-0,28	-0,18	-0,13	-0,10	-0,14	-0,13
Prospector	0,16	0,42	0,45	-0,09	-0,11	0,49
Analyser	0,11	-0,08	-0,13	-0,15	-0,14	-0,10
Reactor	0,18	-0,12	-0,13	2,12	2,35	-0,60

Report
Mean

Strategy Types 96	Profit margin 96	Return on equity (ROE) 96	Return on assets (ROA) 96	Return on sales (ROS) 96	Sales/moulds 96	Asset intensity 96	Sales per number employees 96	Profit per employee 96
Defender	1,12	6,98	1,92	86,32	6.759,34	6.217,78	7.509,44	77,16
Prospector	2,41	13,92	6,76	87,47	10.161,44	7.278,87	9.118,71	294,90
Analyser	2,24	15,07	2,48	92,24	7.030,87	6.235,87	6.617,05	152,87
Reactor	1,13	8,44	2,03	98,41	7.666,02	5.428,58	5.931,85	65,30
Total	1,91	12,16	3,37	89,68	7.785,44	6.451,13	7.461,05	162,55
Std. Deviation	2,55	24,88	7,89	41,81	5.222,56	3.770,26	3.191,44	315,28

Strategy Types 96	Profit margin 96	Return on equity (ROE) 96	Return on assets (ROA) 96	Return on sales (ROS) 96	Sales/moulds 96	Asset intensity 96	Sales per number employees 96	Profit per employee 96
Defender	-0,31	-0,21	-0,18	-0,08	-0,20	-0,06	0,02	-0,27
Prospector	0,20	0,07	0,43	-0,05	0,45	0,22	0,52	0,42
Analyser	0,13	0,12	-0,11	0,06	-0,14	-0,06	-0,26	-0,03
Reactor	-0,31	-0,15	-0,17	0,21	-0,02	-0,27	-0,48	-0,31

Table 5M2 - Means, strategy types and the organisational performance ratios; the evolution within each performance ratio, 1980-96

Report
Mean

Strategy Types	Profit margin 86	Profit margin 92	Profit margin 95	Profit margin 96
Defender	0,15	0,01	-0,28	-0,31
Prospector	-0,46	-0,05	0,16	0,20
Analyser	0,02	-0,03	0,11	0,13
Reactor	0,82	0,51	0,18	-0,31
Total	0,00	0,00	0,00	0,00

Report
Mean

Strategy Types	Return on equity (ROE) 86	Return on equity (ROE) 92	Return on equity (ROE) 95	Return on equity (ROE) 96
Defender	-0,07	0,19	-0,18	-0,21
Prospector	-0,22	-0,33	0,42	0,07
Analyser	0,16	0,00	-0,08	0,12
Reactor	0,40	0,26	-0,12	-0,15
Total	0,00	0,00	0,00	0,00

Report
Mean

Strategy Types	Return on assets (ROA) 86	Return on assets (ROA) 92	Return on assets (ROA) 95	Return on assets (ROA) 96
Defender	0,07	0,14	-0,13	-0,18
Prospector	-0,44	-0,39	0,45	0,43
Analyser	-0,07	0,13	-0,13	-0,11
Reactor	1,40	0,16	-0,13	-0,17
Total	0,00	0,00	0,00	0,00

Report
Mean

Strategy Types	Return on sales (ROS) 86	Return on sales (ROS) 92	Return on sales (ROS) 95	Return on sales (ROS) 96
Defender	0,32	0,11	-0,10	-0,08
Prospector	-0,05	0,18	-0,09	-0,05
Analyser	-0,18	-0,29	-0,15	0,06
Reactor	-0,37	0,13	2,12	0,21
Total	0,00	0,00	0,00	0,00

Table 5M2 Cont. - Means, strategy types and the organisational performance ratios; the evolution within each performance ratio, 1980-96

Report
Mean

Strategy Types	Sales growth 86	Sales growth 92	Sales growth 95
Defender	0,31	0,20	-0,14
Prospector	-0,19	-0,42	-0,11
Analyser	-0,19	0,03	-0,14
Reactor	0,09	0,59	2,35
Total	0,00	0,00	0,00

Report
Mean

Strategy Types	Sales/moulds 86	Sales/moulds 92	Sales/moulds 95	Sales/moulds 96
Defender	0,00	-0,05	-0,13	-0,20
Prospector	0,15	0,32	0,49	0,45
Analyser	0,03	-0,22	-0,10	-0,14
Reactor	-0,78	0,29	-0,60	-0,02
Total	0,00	0,00	0,00	0,00

Figure 5M2 - Means, strategy types and the organisational performance ratios; the evolution within each performance ratio, 1980-96

Figure 5M2A - Profit margin, 1980-96

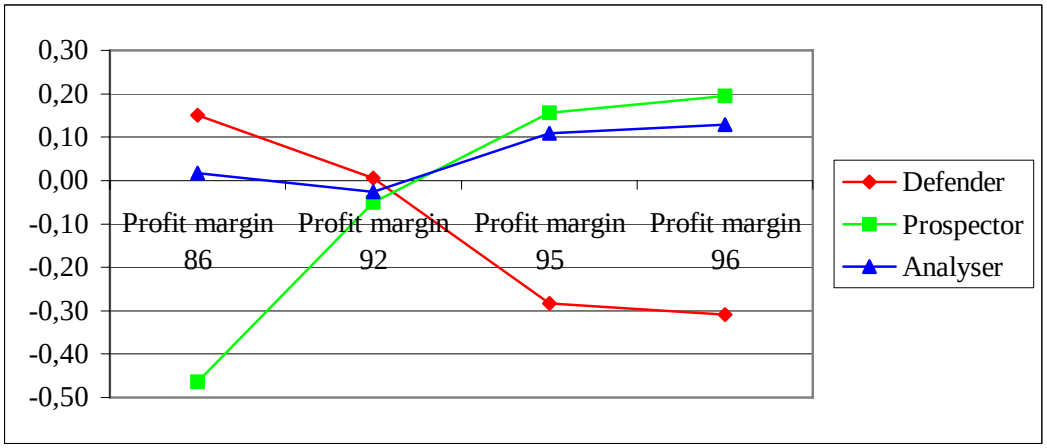


Figure 5M2B - Return on equity, 1980-96

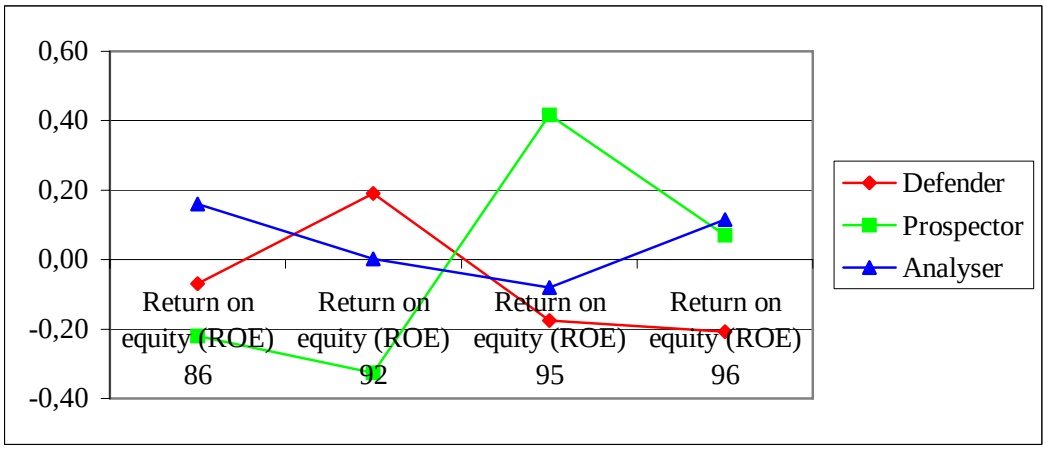


Figure 5M2C - Return on assets, 1980-96

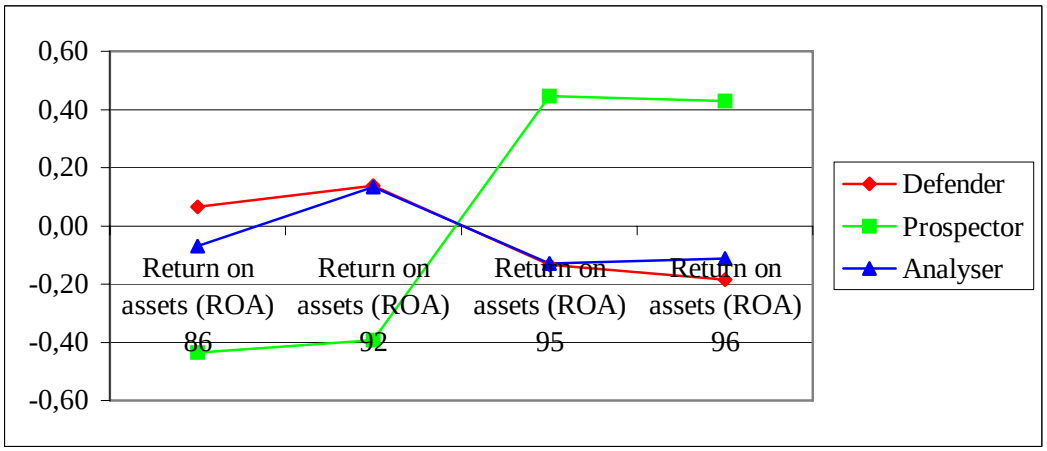


Figure 5M2 Cont. - Means, Strategy types and the organisational performance ratios; the evolution within each performance ratio, 1980-96

Figure 5M2D - Return on sales, 1980-96

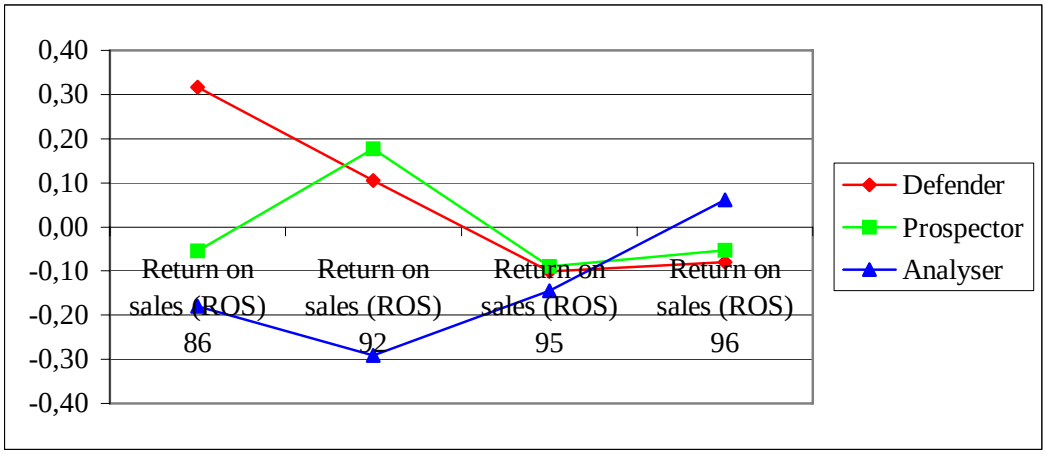


Figure 5M2E - Sales growth, 1980-96

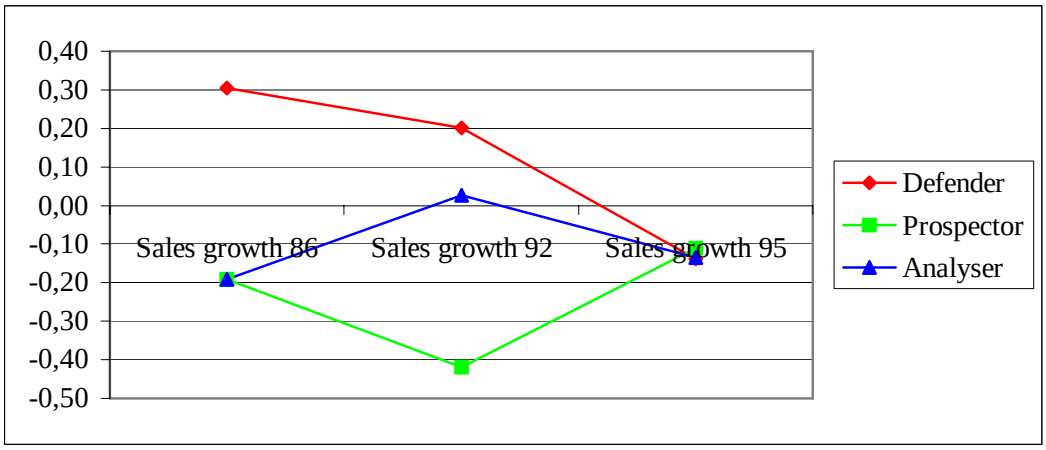
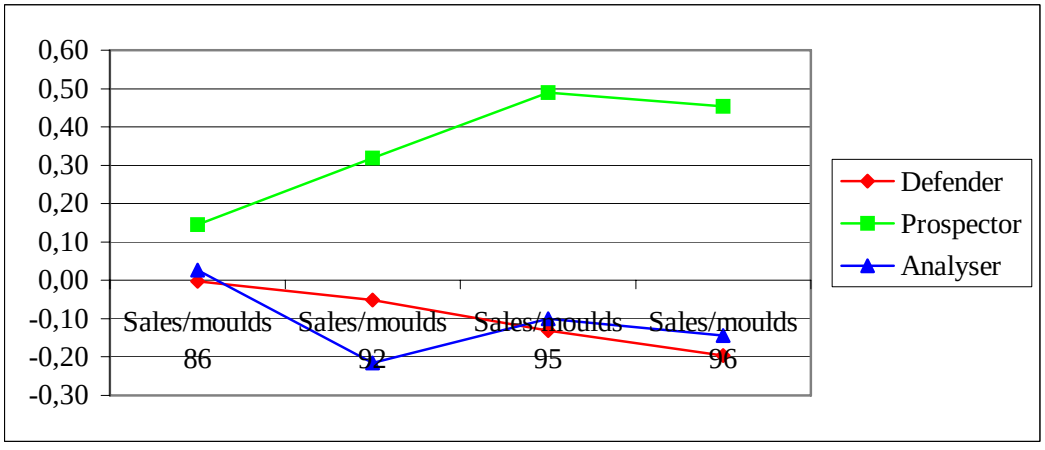


Figure 5M2F – Sales/ number of moulds 1980-96



Note: As there were only three Reactors, the means biases the results. There was therefore, the need to show the value of the organisational performance ratios. The findings clearly reveal that Defenders, Prospectors and Analysers outperformed Reactors in all the performance measures.

Table 5M3 - Strategy types and performance ratios in value, 1980-96

Report
Sum

Strategy Types 86	Profit margin 86	Return on equity (ROE) 86	Return on assets (ROA) 86	Return on sales (ROS) 86	Sales growth 86	Sales/moulds 86
Defender	77,56	305,12	77,93	2.522,61	5.426,77	24.392,00
Prospector	30,01	183,54	23,21	1.403,27	1.635,52	21.815,15
Analyser	63,86	376,88	64,42	1.401,19	1.960,53	24.849,60
Reactor	27,55	118,66	54,71	245,72	919,43	2.279,22
Total	198,97	984,20	220,27	5.572,79	9.942,25	73.335,97

Report
Sum

Strategy Types 92	Profit margin 92	Return on equity (ROE) 92	Return on assets (ROA) 92	Return on sales (ROS) 92	Sales growth 92	Sales/moulds 92
Defender	3,13	147,00	28,65	2.487,86	2.119,53	95.532,67
Prospector	-2,37	-347,74	-368,50	1.726,00	541,15	75.718,09
Analyser	-0,55	-77,10	20,02	1.557,99	1.416,35	70.886,60
Reactor	6,03	22,97	4,99	240,11	278,83	5.335,62
Total	6,24	-254,86	-314,84	6.011,96	4.355,87	247.472,98

Report
Sum

Strategy Types 95	Profit margin 95	Return on equity (ROE) 95	Return on assets (ROA) 95	Return on sales (ROS) 95	Sales growth 95	Sales/moulds 95
Defender	3,13	147,00	28,65	2.487,86	2.119,53	95.532,67
Prospector	-2,37	-347,74	-368,50	1.726,00	541,15	75.718,09
Analyser	-0,55	-77,10	20,02	1.557,99	1.416,35	70.886,60
Reactor	6,03	22,97	4,99	240,11	278,83	5.335,62
Total	6,24	-254,86	-314,84	6.011,96	4.355,87	247.472,98

Report
Sum

Strategy Types 96	Profit margin 96	Return on equity (ROE) 96	Return on assets (ROA) 96	Return on sales (ROS) 96	Sales growth 96	Sales/moulds 96
Defender	3,13	147,00	28,65	2.487,86	2.119,53	95.532,67
Prospector	-2,37	-347,74	-368,50	1.726,00	541,15	75.718,09
Analyser	-0,55	-77,10	20,02	1.557,99	1.416,35	70.886,60
Reactor	6,03	22,97	4,99	240,11	278,83	5.335,62
Total	6,24	-254,86	-314,84	6.011,96	4.355,87	247.472,98

Appendix 5N - Strategic differences between *Stayers* and *Movers*

Table 5N1 - Frequencies of *Stayers*, i.e. firms that maintained Miles and Snow's strategy types over the period, 1980-97

TYPE86

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	12	32%	40%	40%
	Prospector	6	16%	20%	60%
	Analyser	11	30%	37%	97%
	Reactor	1	3%	3%	100%
	Total	30	81%	100%	
Missing	0	7	19%		
Total		37	100%		

TYPE92

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	15	41%	43%	43%
	Prospector	7	19%	20%	63%
	Analyser	12	32%	34%	97%
	Reactor	1	3%	3%	100%
	Total	35	95%	100%	
Missing	0	2	5%		
Total		37	100%		

TYPE95

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	16	43%	43%	43%
	Prospector	8	22%	22%	65%
	Analyser	12	32%	32%	97%
	Reactor	1	3%	3%	100%
	Total	37	100%	100%	

TYPE96

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	16	43%	43%	43%
	Prospector	8	22%	22%	65%
	Analyser	12	32%	32%	97%
	Reactor	1	3%	3%	100%
	Total	37	100%	100%	

TYPE97

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	16	43%	43%	43%
	Prospector	8	22%	22%	65%
	Analyser	12	32%	32%	97%
	Reactor	1	3%	3%	100%
	Total	37	100%	100%	43%

Table 5N2 - Frequencies of *Movers*, i.e. firms that changed Miles and Snow's strategy types over the period, 1980-97

TYPE86

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	9	35%	47%	47%
	Prospector	5	19%	26%	74%
	Analyser	2	8%	11%	84%
	Reactor	3	12%	16%	100%
	Total	19	73%	100%	
Missing	0	7	27%		
Total		26	100%		

TYPE92

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	10	38%	40%	40%
	Prospector	7	27%	28%	68%
	Analyser	6	23%	24%	92%
	Reactor	2	8%	8%	100%
	Total	25	96%	100%	
Missing	0	1	4%		
Total		26	100%		

TYPE95

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	5	19%	19%	19%
	Prospector	6	23%	23%	42%
	Analyser	12	46%	46%	88%
	Reactor	3	12%	12%	100%
	Total	26	100%	100%	

TYPE96

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	2	8%	8%	8%
	Prospector	8	31%	31%	38%
	Analyser	14	54%	54%	92%
	Reactor	2	8%	8%	100%
	Total	26	100%	100%	

TYPE97

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Defender	1	4%	4%	4%
	Prospector	6	23%	23%	27%
	Analyser	17	65%	65%	92%
	Reactor	2	8%	8%	100%
	Total	26	100%	100%	

Table 5N3 - Cross-tabulation, differences between *Stayer* and *Mover* strategic groups and the capacity of the manufactured mould, 1980-97

DYNAMIC1 * Capacity 86r Cross-tabulation % within DYNAMIC1

	Capacity 86r				
DYNAMIC1	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always	33%	42%	25%		100%
Prospector - always		17%	50%	33%	100%
Analyser - always	55%	18%		27%	100%
Reactor always		100%			100%
Have changed	26%	47%	16%	11%	100%
Total	31%	37%	18%	14%	100%

DYNAMIC1 * Capacity 92r Cross-tabulation % within DYNAMIC1

	Capacity 92r				
DYNAMIC1	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always	27%	53%	13%	7%	100%
Prospector - always	14%	14%	43%	29%	100%
Analyser - always	33%	25%	17%	25%	100%
Reactor always		100%			100%
Have changed	28%	44%	20%	8%	100%
Total	27%	40%	20%	13%	100%

DYNAMIC1 * Capacity 95r Cross-tabulation % within DYNAMIC1

	Capacity 95r				
DYNAMIC1	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always	19%	50%	19%	13%	100%
Prospector - always	13%	13%		75%	100%
Analyser - always	25%	8%	42%	25%	100%
Reactor always		100			100%
Have changed	12%	38%	35%	15%	100%
Total	16%	33%	27%	24%	100%

DYNAMIC1 * Capacity 96r Cross-tabulation % within DYNAMIC1

	Capacity 96r				
DYNAMIC1	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always	19%	44%	25%	13%	100%
Prospector - always	13%	13%		75%	100%
Analyser - always	25%	8%	25%	42%	100%
Reactor always		100%			100%
Have changed	8%	35%	42%	15%	100%
Total	14%	30%	29%	27%	100%

Table 5N3 Cont. - Cross-tabulation, differences between *Stayer* and *Mover* strategic groups and the capacity of the manufactured mould, 1980-97

DYNAMIC1 * Capacity 97r Cross-tabulation % within DYNAMIC1

	Capacity 97r				
DYNAMIC1	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always	19%	44%	25%	13%	100%
Prospector - always	13%	13%		75%	100%
Analyser - always	25%	8%	25%	42%	100%
Reactor always		100%			100%
Have changed	8%	28%	36%	28%	100%
Total	15%	27%	26%	32%	100%

Table 5N4 - Cross-tabulation, differences between patterns of *Stayers* and *Movers* for each strategy type, and the capacity of the manufactured mould, 1980-97

DYNAMIC * Capacity 86r Cross-tabulation % within DYNAMIC

	Capacity 86r				
DYNAMIC	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always	33%	42%	25%		100%
Prospector - always		17%	50%	33%	100%
Analyser - always	55%	18%		27%	100%
Reactor always		100%			100%
Defender-Analyser		40%	40%	20%	100%
Defender-Prospector	33%	33%		33%	100%
Prospector-Analyser	25%	75%			100%
Analyser-Prospector	100%				100%
Reactor-Analyser	50%	50%			100%
Total	31%	37%	18%	14%	100%

DYNAMIC * Capacity 92r Cross-tabulation % within DYNAMIC

	Capacity 92r				
DYNAMIC	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always		60%	40%		100%
Prospector - always	27%	53%	13%	7%	100%
Analyser - always	14%	14%	43%	29%	100%
Reactor always	33%	25%	17%	25%	100%
Defender-Analyser		100%			100%
Defender-Prospector		20%	60%	20%	100%
Prospector-Analyser	33%	33%		33%	100%
Analyser-Prospector	40%	60%			100%
Reactor-Analyser	100%				100%
Total	25%	75%			100%

DYNAMIC * Capacity 95r Cross-tabulation % within DYNAMIC

	Capacity 95r				
DYNAMIC	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always		60%	40%		100%
Prospector - always	19%	50%	19%	13%	100%
Analyser - always	13%	13%		75%	100%
Reactor always	25%	8%	42%	25%	100%
Defender-Analyser		100%			100%
Defender-Prospector			80%	20%	100%
Prospector-Analyser		67%		33%	100%
Analyser-Prospector	20%	60%	20%		100%
Reactor-Analyser	67%	33%			100%
Total		20%	40%	40%	100%

Table 5N4 Cont. - Cross-tabulation, differences between patterns of *Stayers* and *Movers* for each strategy type, and the capacity of the manufactured mould, 1980-97

DYNAMIC * Capacity 96r Cross-tabulation % within DYNAMIC

	Capacity 96r				
DYNAMIC	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always		60%	40%		100%
Prospector - always	19%	44%	25%	13%	100%
Analyser - always	13%	13%		75%	100%
Reactor always	25%	8%	25%	42%	100%
Defender-Analyser		100%			100%
Defender-Prospector			80%	20%	100%
Prospector-Analyser		33%	33%	33%	100%
Analyser-Prospector	20%	60%	20%		100%
Reactor-Analyser	33%	33%	33%		100%
Total		20%	40%	40%	100%

DYNAMIC * Capacity 97r Cross-tabulation % within DYNAMIC

	Capacity 97r				
DYNAMIC	Up to 1999	2000-4999	5000-9999	Over 10,000	Total
Defender - always		25%	75%		100%
Prospector - always	19%	44%	25%	13%	100%
Analyser - always	13%	13%		75%	100%
Reactor always	25%	8%	25%	42%	100%
Defender-Analyser		100%			100%
Defender-Prospector			60%	40%	100%
Prospector-Analyser		33%	33%	33%	100%
Analyser-Prospector	20%	60%		20%	100%
Reactor-Analyser	33%	33%	33%		100%
Total		20%	20%	60%	100%

Table 5N5 - Cross-tabulation, differences between *Stayer* and *Mover* strategic groups and the complexity of the manufactured mould, 1980-97

DYNAMIC1 * Mould complexity 86 Cross-tabulation % within DYNAMIC1

	Mould complexity 86			
DYNAMIC1	Low	Medium	High	Total
Defender - always	67%	33%		100%
Prospector - always	50%	17%	33%	100%
Analyser - always	64%	9%	27%	100%
Reactor always	100%			100%
Have changed	68%	21%	11%	100%
Total	65%	20%	14%	100%

DYNAMIC1 * Mould complexity 92 Cross-tabulation % within DYNAMIC1

	Mould complexity 92			
DYNAMIC1	Low	Medium	High	Total
Defender - always	47%	40%	13%	100%
Prospector - always	29%	29%	43%	100%
Analyser - always	25%	33%	42%	100%
Reactor always	100%			100%
Have changed	44%	40%	16%	100%
Total	40%	37%	23%	100%

DYNAMIC1 * Mould complexity 95 Cross-tabulation % within DYNAMIC1

	Mould complexity 95			
DYNAMIC1	Low	Medium	High	Total
Defender - always	31%	44%	25%	100%
Prospector - always	13%	38%	50%	100%
Analyser - always	33%	33%	33%	100%
Reactor always	100%			100%
Have changed	31%	54%	15%	100%
Total	30%	44%	25%	100%

DYNAMIC1 * Mould complexity 96 Cross-tabulation % within DYNAMIC1

	Mould complexity 96			
DYNAMIC1	Low	Medium	High	Total
Defender - always	31%	44%	25%	100%
Prospector - always	25%	25%	50%	100%
Analyser - always	33%	33%	33%	100%
Reactor always	100%			100%
Have changed	15%	65%	19%	100%
Total	25%	48%	27%	100%

Table 5N5 Cont. - Cross-tabulation, differences between *Stayer* and *Mover* strategic groups and the complexity of the manufactured mould, 1980-97

DYNAMIC1 * Mould complexity 97 Cross-tabulation % within DYNAMIC1

	Mould complexity 97			
DYNAMIC1	Low	Medium	High	Total
Defender - always	38%	38%	25%	100%
Prospector - always	13%	38%	50%	100%
Analyser - always	33%	33%	33%	100%
Reactor always	100%			100%
Have changed	15%	65%	19%	100%
Total	25%	48%	27%	100%

Table 5N6 - Cross-tabulation, differences between patterns of *Stayers* and *Movers* for each strategy type, and the complexity of the manufactured mould, 1980-97

DYNAMIC * Complexity 86r Cross-tabulation % within DYNAMIC

	Capacity 86r			
DYNAMIC	Low	Medium	High	Total
Defender - always	100			100%
Prospector - always	67	33		100%
Analyser - always	50	17	33	100%
Reactor always	64	9	27	100%
Defender-Analyser	100			100%
Defender-Prospector	40	60		100%
Prospector-Analyser	67	33		100%
Analyser-Prospector	75		25	100%
Reactor-Analyser	100			100%
Total	50		50	100%

DYNAMIC * Complexity 92r Cross-tabulation % within DYNAMIC

	Capacity 92r			
DYNAMIC	Low	Medium	High	Total
Defender - always	60	20	20	100%
Prospector - always	47	40	13	100%
Analyser - always	29	29	43	100%
Reactor always	25	33	42	100%
Defender-Analyser	100			100%
Defender-Prospector	20	60	20	100%
Prospector-Analyser	67	33		100%
Analyser-Prospector		80	20	100%
Reactor-Analyser	100			100%
Total	50	25	25	100%

DYNAMIC * Complexity 95r Cross-tabulation % within DYNAMIC

	Capacity 95r			
DYNAMIC	Low	Medium	High	Total
Defender - always	20	60	20	100%
Prospector - always	31	44	25	100%
Analyser - always	13	38	50	100%
Reactor always	33	33	33	100%
Defender-Analyser	100			100%
Defender-Prospector		80	20	100%
Prospector-Analyser	33	67		100%
Analyser-Prospector		80	20	100%
Reactor-Analyser	67	33		100%
Total	80		20	100%

Table 5N6 Cont. - Cross-tabulation, differences between patterns of *Stayers* and *Movers* for each strategy type, and the complexity of the manufactured mould, 1980-97

DYNAMIC * Complexity 96r Cross-tabulation % within DYNAMIC

	Capacity 96r			
DYNAMIC	Low	Medium	High	Total
Defender - always	20	60	20	100%
Prospector - always	31	44	25	100%
Analyser - always	25	25	50	100%
Reactor always	33	33	33	100%
Defender-Analyser	100			100%
Defender-Prospector		80	20	100%
Prospector-Analyser		67	33	100%
Analyser-Prospector		80	20	100%
Reactor-Analyser	33	67		100%
Total	40	40	20	100%

DYNAMIC * Complexity 97r Cross-tabulation % within DYNAMIC

	Capacity 97r			
DYNAMIC	Low	Medium	High	Total
Defender - always	20	60	20	100%
Prospector - always	38	38	25	100%
Analyser - always	13	38	50	100%
Reactor always	33	33	33	100%
Defender-Analyser	100			100%
Defender-Prospector		80	20	100%
Prospector-Analyser		67	33	100%
Analyser-Prospector		80	20	100%
Reactor-Analyser	33	67		100%
Total	40	40	20	100%

Table 5N7 - Differences between *Stayer* and *Mover* strategic groups and the markets to which firms have been selling, 1980-96

1980-86

Report
Sum

DYNAMIC1	American 86	German 86	Brazilian 86	British 86	French 86	Dutch 86	Israelit 86	Portuguese 86	Spanish 86	Belgium 86	Swedish 86	Other markets 86
Defender - always	181.777	3.556	0	19.693	9.094	19.693	0	0	0	0	0	5.410
Prospector - always	548.179	51.446	0	128.615	21.461	21.461	0	259.892	0	0	0	4.171
Analyser - always	669.431	30.841	49.940	12.956	0	0	75.972	0	0	0	0	29.700
Reactor - always	0	0	0	0	0	0	0	0	0	0	0	0
Have changed	365.982	92.551	37.762	24.958	0	0	4.939	16.473	25.344	0	0	32.717
Total	1.765.369	178.395	87.702	186.221	30.555	41.154	80.912	276.365	25.344	0	0	71.998

1987-92

Report
Sum

DYNAMIC1	American 92	German 92	Brazilian 92	British 92	French 92	Dutch 92	Israelit 92	Portuguese 92	Spanish 92	Belgium 92	Swedish 92	Other markets 92
Defender - always	610.420	167.955	5.426	59.726	46.470	52.029	0	0	4.000	0	0	5.131
Prospector - always	627.997	310.513	45.051	32.193	122.349	70.841	57.947	330.897	0	0	56.247	32.193
Analyser - always	945.258	45.686	61.899	0	0	0	248.747	0	0	0	0	136.595
Reactor - always	0	0	0	0	0	0	0	0	0	0	0	0
Have changed	896.894	552.765	169.336	83.979	183.606	25.888	26.633	168.401	88.696	4.800	0	77.697
Total	3.080.569	1.076.919	281.712	175.897	352.425	148.757	333.327	499.298	92.696	4.800	56.247	251.616

1993-95

Report
Sum

DYNAMIC1	American 95	German 95	Brazilian 95	British 95	French 95	Dutch 95	Israelit 95	Portuguese 95	Spanish 95	Belgium 95	Swedish 95	Other markets 95
Defender - always	814.641	274.417	100.646	94.457	107.032	73.228	0	0	11.500	0	0	28.615
Prospector - always	708.197	392.116	201.846	59.577	186.128	146.832	49.648	425.422	0	0	135.112	29.789
Analyser - always	485.195	32.947	93.656	20.000	59.668	0	292.605	0	0	0	0	173.396
Reactor - always	0	0	0	0	0	0	0	0	0	0	0	0
Have changed	736.437	1.073.179	655.550	151.379	674.190	206.879	96.805	230.592	236.747	43.200	50.185	83.576
Total	2.744.470	1.772.658	1.051.699	325.413	1.027.018	426.939	439.058	656.014	248.247	43.200	185.297	315.375

1996

Report
Sum

DYNAMIC1	American 96	German 96	Brazilian 96	British 96	French 96	Dutch 96	Israelit 96	Portuguese 96	Spanish 96	Belgium 96	Swedish 96	Other markets 96
Defender - always	1.173.625	452.883	243.542	173.775	187.859	108.731	0	0	57.607	23.229	62.360	75.000
Prospector - always	568.084	129.961	505.093	77.196	211.512	577.613	0	436.340	0	0	399.136	39.914
Analyser - always	545.565	117.958	244.265	211.835	17.887	0	531.568	0	0	0	0	182.956
Reactor - always	0	0	0	0	0	0	0	0	0	0	0	0
Have changed	770.814	1.342.225	1.076.237	88.818	521.657	197.594	103.083	288.939	427.943	51.429	129.511	261.263
Total	3.058.088	2.043.026	2.069.136	551.624	938.915	883.938	634.650	725.278	485.550	74.658	591.006	559.132

Table 5N8 - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the markets to which firms have been selling, 1980-96

1980-86

Report
Sum

DYNAMIC	American 86	German 86	Brazilian 86	British 86	French 86	Dutch 86	Israelite 86	Portuguese 86	Spanish 86	Belgium 86	Swedish 86	Other markets 86
Other changes	42.890	47.203	37.762	23.602	0	0	0	11.533	0	0	0	16.521
Defender-always	181.777	3.556	0	19.693	9.094	19.693	0	0	0	0	0	5.410
Prospector-always	548.179	51.446	0	128.615	21.461	21.461	0	259.892	0	0	0	4.171
Analyser-always	669.431	30.841	49.940	12.956	0	0	75.972	0	0	0	0	29.700
Reactor-always	0	0	0	0	0	0	0	0	0	0	0	0
Defender-Analyser	139.118	4.068	0	1.356	0	0	0	0	0	0	0	16.196
Defender-Prospector	14.000	0	0	0	0	0	0	0	0	0	0	0
Prospector-Analyser	123.878	32.506	0	0	0	0	0	0	0	0	0	0
Analyser-Prospector	39.515	0	0	0	0	0	4.939	4.939	0	0	0	0
Reactor-Analyser	6.581	8.774	0	0	0	0	0	0	25.344	0	0	0
Total	1.765.369	178.395	87.702	186.221	30.555	41.154	80.912	276.365	25.344	0	0	71.998

1987-92

Report
Sum

DYNAMIC	American 92	German 92	Brazilian 92	British 92	French 92	Dutch 92	Israelit 92	Portuguese 92	Spanish 92	Belgium 92	Swedish 92	Other markets 92
Other changes	57.350	108.984	166.682	58.193	0	14.688	26.633	36.718	0	0	0	51.287
Defender-always	610.420	167.955	5.426	59.726	46.470	52.029	0	0	4.000	0	0	5.131
Prospector-always	627.997	310.513	45.051	32.193	122.349	70.841	57.947	330.897	0	0	56.247	32.193
Analyser-always	945.258	45.686	61.899	0	0	0	248.747	0	0	0	0	136.595
Reactor-always	0	0	0	0	0	0	0	0	0	0	0	0
Defender-Analyser	197.694	178.809	0	14.582	93.706	0	0	0	16.453	0	0	26.410
Defender-Prospector	35.000	0	0	0	0	0	0	0	0	0	0	0
Prospector-Analyser	372.841	22.596	0	0	0	0	0	0	0	0	0	0
Analyser-Prospector	178.005	31.856	2.655	0	73.093	11.200	0	109.273	5.000	4.800	0	0
Reactor-Analyser	56.005	210.521	0	11.205	16.807	0	0	22.410	67.243	0	0	0
Total	3.080.569	1.076.919	281.712	175.897	352.425	148.757	333.327	499.298	92.696	4.800	56.247	251.616

1993-95

Report
Sum

DYNAMIC	American 95	German 95	Brazilian 95	British 95	French 95	Dutch 95	Israelit 95	Portuguese 95	Spanish 95	Belgium 95	Swedish 95	Other markets 95
Other changes	42.498	412.141	283.438	93.227	0	22.900	96.805	70.831	0	0	0	56.201
Defender-always	814.641	274.417	100.646	94.457	107.032	73.228	0	0	11.500	0	0	28.615
Prospector-always	708.197	392.116	201.846	59.577	186.128	146.832	49.648	425.422	0	0	135.112	29.789
Analyser-always	485.195	32.947	93.656	20.000	59.668	0	292.605	0	0	0	0	173.396
Reactor-always	0	0	0	0	0	0	0	0	0	0	0	0
Defender-Analyser	178.056	179.545	99.985	43.375	397.337	0	0	7.426	44.557	0	0	6.580
Defender-Prospector	60.000	0	0	0	0	0	0	0	0	0	0	0
Prospector-Analyser	198.725	22.082	19.622	0	0	0	0	0	0	0	50.185	0
Analyser-Prospector	181.564	60.954	24.954	0	198.041	183.980	0	120.318	20.000	43.200	0	20.795
Reactor-Analyser	75.593	398.457	227.551	14.777	78.812	0	0	32.017	172.190	0	0	0
Total	2.744.470	1.772.658	1.051.699	325.413	1.027.018	426.939	439.058	656.014	248.247	43.200	185.297	315.375

Table 5N8 Cont. - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the markets to which firms have been selling, 1980-96

1996

Report
Sum

DYNAMIC	American 96	German 96	Brazilian 96	British 96	French 96	Dutch 96	Israelit 96	Portuguese 96	Spanish 96	Belgium 96	Swedish 96	Other markets 96
Other changes	21.294	439.704	174.341	21.722	0	18.259	87.980	149.055	9.129	9.129	0	42.898
Defender-always	1.173.625	452.883	243.542	173.775	187.859	108.731	0	0	57.607	23.229	62.360	75.000
Prospector-always	568.084	129.961	505.093	77.196	211.512	577.613	0	436.340	0	0	399.136	39.914
Analyser-always	545.565	117.958	244.265	211.835	17.887	0	531.568	0	0	0	0	182.956
Reactor-always	0	0	0	0	0	0	0	0	0	0	0	0
Defender-Analyser	234.198	157.257	488.530	51.993	198.808	0	0	35.514	186.449	0	0	6.867
Defender-Prospector	114.000	0	0	0	0	0	0	0	57.000	0	0	0
Prospector-Analyser	215.118	23.629	44.218	0	0	0	0	0	0	0	129.511	121.028
Analyser-Prospector	91.545	90.843	40.687	0	232.232	149.129	0	50.000	75.000	42.300	0	71.202
Reactor-Analyser	94.659	630.792	328.462	15.103	90.617	30.206	15.103	54.370	100.365	0	0	19.268
Total	3.058.088	2.043.026	2.069.136	551.624	938.915	883.938	634.650	725.278	485.550	74.658	591.006	559.132

Table 5N9 - Differences between *Stayer* and *Mover* strategic groups and the industry clients, 1980-96

1980-86

Report
Sum

DYNAMIC1	Automobile 86	Electric/ Electronic 86	Domestic Appliances 86	Toy 86	Domestic Utilities 86	Other Industries 86
Defender - always	46.242	111.546	75.044	32.705	90.217	31.886
Prospector - always	112.241	213.014	192.032	283.912	178.904	41.659
Analyser - always	177.280	298.981	137.727	281.067	215.108	98.211
Have changed	162.087	154.199	445.529	408.807	130.550	219.117
Total	497.850	777.741	850.332	1.006.491	614.779	390.873

1987-92

Report
Sum

DYNAMIC1	Automobile 92	Electric /Electronic 92	Domestic Appliances 92	Toy 92	Domestic Utilities 92	Other Industries 92
Defender - always	227.120	396.160	382.533	332.173	388.494	174.810
Prospector - always	561.834	643.898	934.952	390.732	221.959	280.136
Analyser - always	805.318	792.644	650.500	327.856	390.032	180.556
Have changed	740.082	804.205	1.541.483	446.692	449.767	540.170
Total	2.334.354	2.636.907	3.509.469	1.497.453	1.450.251	1.175.672

1993-95

Report
Sum

DYNAMIC1	Automobile 95	Electric /Electronic 95	Domestic appliances 95	Toy 95	Domestic utilities 95	Other industries 95
Defender - always	495.912	723.234	583.050	279.922	793.037	486.658
Prospector - always	2.225.292	893.054	1.211.392	383.186	489.355	441.048
Analyser - always	1.845.196	911.921	983.548	311.350	595.165	86.910
Reactor - always				6.806	6.806	3.403
Have changed	1.735.339	968.086	2.489.007	294.619	783.760	1.793.490
Total	6.301.738	3.496.294	5.266.996	1.275.883	2.668.124	2.811.510

1996

Report
Sum

DYNAMIC1	Automobile 96	Electric /Electronic 96	Domestic Appliances 96	Toy 96	Domestic Utilities 96	Other Industries 96
Defender - always	806.671	967.863	944.968	327.875	1.291.603	511.812
Prospector - always	4.144.365	973.928	1.576.666	147.921	1.001.999	611.906
Analyser - always	2.545.480	546.967	715.658	340.285	729.712	348.170
Reactor - always				78.823	118.234	65.686
Have changed	3.117.931	1.449.896	2.462.810	137.926	707.937	2.447.392
Total	10.614.447	3.938.654	5.700.101	1.032.828	3.849.485	3.984.967

Table 5N10 - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the industry clients, 1980-96

1980-86

Report
Sum

DYNAMIC	Aut. 86	Elect/Electronic 86	Domestic appliances 86	Toy 86	Domestic utilities 86	Other industries 86
Other changes	11.801	94.834	66.255	89.668	76.955	57.606
Defender-always	46.242	111.546	75.044	32.705	90.217	31.886
Prospector-always	112.241	213.014	192.032	283.912	178.904	41.659
Analyser-always	177.280	298.981	137.727	281.067	215.108	98.211
Defender-Analyser	19.912	25.333	31.467	68.192	16.746	13.179
Defender-Prospector	120.000		226.000	56.000		120.000
Prospector-Analyser	8.181	24.301	82.586	158.747	779	3.117
Analyser-Prospector		2.470	24.697	17.288	22.227	4.939
Reactor-Analyser	2.194	7.262	14.525	18.912	13.843	20.275
Total	497.850	777.741	850.332	1.006.491	614.779	390.873

1987-92

Report
Sum

DYNAMIC	Aut. 92	Elect/Electronic 92	Domestic appliances 92	Toy 92	Domestic utilities 92	Other industries 92
Other changes	113.766	390.588	162.367	121.759	112.788	115.168
Defender-always	227.120	396.160	382.533	332.173	388.494	174.810
Prospector-always	561.834	643.898	934.952	390.732	221.959	280.136
Analyser-always	805.318	792.644	650.500	327.856	390.032	180.556
Defender-Analyser	129.775	114.603	381.267	73.281	118.012	13.413
Defender-Prospector	257.500		357.500	35.000		300.000
Prospector-Analyser	84.505	179.196	374.145	74.679	67.044	21.560
Analyser-Prospector	33.928	60.856	156.819	79.639	74.020	45.201
Reactor-Analyser	120.608	58.963	109.384	62.334	77.902	44.828
Total	2.334.354	2.636.907	3.509.469	1.497.453	1.450.251	1.175.672

1993-95

Report
Sum

DYNAMIC	Aut. 95	Elect/Electronic 95	Domestic appliances 95	Toy 95	Domestic utilities 95	Other industries 95
Other changes	322.931	450.888	249.468	24.183	243.302	226.695
Defender-always	495.912	723.234	583.050	279.922	793.037	486.658
Prospector-always	2.225.292	893.054	1.211.392	383.186	489.355	441.048
Analyser-always	1.845.196	911.921	983.548	311.350	595.165	86.910
Reactor-always				6.806	6.806	3.403
Defender-Analyser	390.672	146.170	631.974	93.089	75.998	157.200
Defender-Prospector	230.000		600.000			1.070.000
Prospector-Analyser	122.240	138.065	500.976	57.189	211.409	52.894
Analyser-Prospector	170.226	86.477	309.564	41.590	123.975	144.067
Reactor-Analyser	499.271	146.486	197.025	78.568	129.076	142.635
Total	6.301.738	3.496.294	5.266.996	1.275.883	2.668.124	2.811.510

Table 5N10 Cont. - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the industry clients, 1980-96

1996

Report
Sum

DYNAMIC	Aut. 96	Elect/Electronic 96	Domestic appliances 96	Toy 96	Domestic utilities 96	Other industries 96
Other changes	507.041	583.958	304.305	5.068	193.734	237.251
Defender-always	806.671	967.863	944.968	327.875	1.291.603	511.812
Prospector-always	4.144.365	973.928	1.576.666	147.921	1.001.999	611.906
Analyser-always	2.545.480	546.967	715.658	340.285	729.712	348.170
Reactor-always				78.823	118.234	65.686
Defender-Analyser	994.786	159.878	355.403	57.137	141.442	70.389
Defender-Prospector	95.000		426.000			1.459.000
Prospector-Analyser	404.302	263.124	487.683	36.655	53.368	264.247
Analyser-Prospector	337.202	136.187	423.293		111.459	220.444
Reactor-Analyser	779.601	306.750	466.126	39.065	207.934	196.061
Total	10.614.447	3.938.654	5.700.101	1.032.828	3.849.485	3.984.967

Table 5N11 - Differences between *Stayer* and *Mover* strategic groups and the areas of investment, 1980-96

1980-86

Report
Sum

DYNAMIC1	Invest. R&D 86	Invest. Technology 86	Invest. Infrastructures 86	Invest. Marketing -trading 86	Invest. Customer Relationship 86	Invest. Training 86
Defender - always	0	201.298	46.148	19.559	2.490	5.273
Prospector - always	0	575.806	62.120	127.449	50.290	50.599
Analyser - always	5.113	417.234	518.844	56.551	31.888	51.092
Reactor always	0	0	0	0	0	0
Have changed	5.556	845.113	588.648	103.787	106.017	63.092
Total	10.668	2.039.450	1.215.760	307.346	190.685	170.055

1987-92

Report
Sum

DYNAMIC1	Invest. R&D 92	Invest. Technology 92	Invest. Infrastructures 92	Invest. Marketing -trading 92	Invest. Customer Relationship 92	Invest. Training 92
Defender - always	10.600	1.811.866	43.319	213.005	100.474	33.309
Prospector - always	105.593	1.494.068	295.570	138.256	117.818	99.826
Analyser - always	32.299	1.406.031	444.122	103.915	57.357	81.799
Reactor always	0	0	0	0	0	0
Have changed	39.713	3.346.714	869.663	427.845	685.304	553.748
Total	188.204	8.058.679	1.652.675	883.021	960.952	768.682

1993-95

Report
Sum

DYNAMIC1	Invest. R&D 95	Invest. Technology 95	Invest. Infrastructures 95	Invest. Marketing -trading 95	Invest. Customer Relationship 95	Invest. Training 95
Defender - always	17.500	1.710.383	678.351	264.875	86.677	87.450
Prospector - always	469.324	3.618.564	435.492	715.378	310.166	338.475
Analyser - always	42.404	1.979.458	48.413	144.644	83.166	101.882
Reactor always	0	104.617	0	0	0	11.624
Have changed	115.912	5.651.279	890.106	756.134	698.840	351.156
Total	645.140	13.064.301	2.052.362	1.881.031	1.178.849	890.588

1996

Report
Sum

DYNAMIC1	Invest. R&D 96	Invest. Technology 96	Invest. Infrastructures 96	Invest. Marketing -trading 96	Invest. Customer Relationship 96	Invest. Training 96
Defender - always	66.495	2.615.473	245.739	344.780	86.850	135.194
Prospector - always	290.380	4.655.221	1.748.404	674.373	327.470	523.163
Analyser - always	62.201	1.870.880	60.765	139.390	84.549	95.393
Reactor always	0	109.791	0	0	0	12.199
Have changed	211.212	6.191.464	2.976.905	807.525	566.639	334.034
Total	630.288,6	15.442.829,0	5.031.814,2	1.966.068,1	1.065.507,4	1.099.983,1

Table 5N12 - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the areas of investment, 1980-96

1980-86

Report
Sum

DYNAMIC	R&D 86	Technology 86	Infrastructures 86	Marketing-trading 86	Customer Relationship 86	Training 86
Other changes	3.457	150.354	43.941	12.216	3.224	2.074
Defender-always	0	201.298	46.148	19.559	2.490	5.273
Prospector-always	0	575.806	62.120	127.449	50.290	50.599
Analyser-always	5.113	417.234	518.844	56.551	31.888	51.092
Reactor-always	0	0	0	0	0	0
Defender-Analyser	0	73.145	12.320	34.783	51.104	0
Defender-Prospector	0	340.000	490.000	50.000	50.000	50.000
Prospector-Analyser	0	146.432	5.660	3.410	0	6.820
Analyser-Prospector	2.099	58.763	36.727	2.099	1.049	4.197
Reactor-Analyser	0	76.418	0	1.279	640	0
Total	10.668	2.039.450	1.215.760	307.346	190.685	170.055

1987-92

Report
Sum

DYNAMIC	R&D 92	Technology 92	Infrastructures 92	Marketing-trading 92	Customer Relationship 92	Training 92
Other changes	0	523.578	194.379	69.423	23.194	19.607
Defender-always	10.600	1.811.866	43.319	213.005	100.474	33.309
Prospector-always	105.593	1.494.068	295.570	138.256	117.818	99.826
Analyser-always	32.299	1.406.031	444.122	103.915	57.357	81.799
Reactor-always	0	0	0	0	0	0
Defender-Analyser	24.616	763.267	122.359	60.243	46.865	47.093
Defender-Prospector	0	1.000.000	144.000	214.000	594.000	428.000
Prospector-Analyser	149	635.300	27.783	29.785	0	34.771
Analyser-Prospector	6.513	248.853	154.176	15.763	5.556	9.769
Reactor-Analyser	8.435	175.715	226.965	38.632	15.689	14.508
Total	188.204	8.058.679	1.652.675	883.021	960.952	768.682

1993-95

Report
Sum

DYNAMIC	R&D 95	Technology 95	Infrastructures 95	Marketing-trading 95	Customer Relationship 95	Training 95
Other changes	0	832.507	297.660	58.925	84.394	16.368
Defender-always	17.500	1.710.383	678.351	264.875	86.677	87.450
Prospector-always	469.324	3.618.564	435.492	715.378	310.166	338.475
Analyser-always	42.404	1.979.458	48.413	144.644	83.166	101.882
Reactor-always	0	104.617	0	0	0	11.624
Defender-Analyser	89.802	1.093.808	58.461	94.472	122.038	44.901
Defender-Prospector	0	1.400.000	175.000	465.000	440.000	220.000
Prospector-Analyser	403	925.020	66.854	65.908	2.013	51.919
Analyser-Prospector	4.563	515.487	82.034	29.540	8.503	13.213
Reactor-Analyser	21.144	884.456	210.096	42.288	41.892	4.755
Total	645.140	13.064.301	2.052.362	1.881.031	1.178.849	890.588

Table 5N12 Cont. - Differences between patterns of *Stayers* and *Movers* for each strategy type, and the areas of investment, 1980-96

1996

Report
Sum

DYNAMIC	R&D 96	Technology 96	Infrastructures 96	Marketing-trading 96	Customer Relationship 96	Training 96
Other changes	6.752	1.430.388	49.525	57.126	34.932	10.113
Defender-always	66.495	2.615.473	245.739	344.780	86.850	135.194
Prospector-always	290.380	4.655.221	1.748.404	674.373	327.470	523.163
Analyser-always	62.201	1.870.880	60.765	139.390	84.549	95.393
Reactor-always	0	109.791	0	0	0	12.199
Defender-Analyser	131.049	664.347	1.233.817	148.868	130.496	79.706
Defender-Prospector	0	1.510.000	854.000	276.000	328.000	52.000
Prospector-Analyser	1.863	1.065.402	138.288	110.847	2.794	59.511
Analyser-Prospector	10.757	653.681	65.941	39.407	11.203	40.403
Reactor-Analyser	60.793	867.645	635.334	175.277	59.213	92.301
Total	630.289	15.442.829	5.031.814	1.966.068	1.065.507	1.099.983

Table 5N13 - Differences between *Stayer* and *Mover* strategic groups and technological investments, 1980-96

Report
Sum

DYNAMIC1	Conv.86	CAD/CAM/ CAE 86	CNC 86	EDM 86	Wire cutting 86	Laser 86	Quality 86	Test injection 86
Defender - always	158.016	2.268	87.678	25.671	0	0	0	0
Prospector - always	385.955	64.195	232.599	126.440	34.272	0	22.803	0
Analyser - always	231.828	220.856	240.177	249.121	136.616	0	2.124	0
Reactor - always	0	0	0	0	0	0	0	0
Have changed	914.703	64.526	625.006	112.331	0	0	5.247	0
Total	1.690.501	351.845	1.185.461	513.563	170.888	0	30.174	0

Report
Sum

DYNAMIC1	Conv.92	CAD/CAM/ CAE 92	CNC 92	EDM 92	Wire cutting 92	Laser 92	Quality 92	Test injection 92
Defender - always	203.719	391.483	1.084.247	198.710	108.238	0	126.708	73.545
Prospector - always	487.354	749.420	599.171	274.388	62.498	0	78.300	0
Analyser - always	40.246	980.645	303.246	157.451	20.000	0	576.640	0
Reactor - always	0	0	0	0	0	0	0	0
Have changed	1.006.628	1.732.371	1.521.148	1.109.308	72.540	31.500	425.028	72.764
Total	1.737.947	3.853.919	3.507.812	1.739.858	263.276	31.500	1.206.675	146.309

Report
Sum

DYNAMIC1	Conv.95	CAD/CAM/ CAE 95	CNC 95	EDM 95	Wire cutting 95	Laser 95	Quality 95	Test injection 95
Defender - always	134.302	687.569	1.554.109	276.308	52.563	0	68.871	5.269
Prospector - always	1.267.780	1.486.476	1.739.477	521.167	179.939	0	551.972	301.357
Analyser - always	32.604	175.366	324.585	165.203	1.343.340	0	48.818	0
Reactor - always	0	116.241	0	0	0	0	0	0
Have changed	1.224.093	1.457.583	2.983.863	1.086.610	319.044	0	898.519	476.894
Total	2.658.778	3.923.235	6.602.034	2.049.287	1.894.887	0	1.568.180	783.520

Report
Sum

DYNAMIC1	Conv.96	CAD/CAM/ CAE 96	CNC 96	EDM 96	Wire cutting 96	Laser 96	Quality 96	Test injection 96
Defender - always	1.772	1.633.148	1.157.156	352.383	129.043	0	169.432	0
Prospector - always	1.945.697	2.091.213	2.147.147	662.620	425.254	0	680.844	266.236
Analyser - always	0	412.499	505.797	78.699	0	0	1.316.184	0
Reactor - always	0	24.398	97.592	0	0	0	0	0
Have changed	650.319	3.494.503	2.971.723	446.554	301.810	0	1.355.643	1.935.960
Total	2.597.788	7.655.760	6.879.415	1.540.256	856.106	0	3.522.103	2.202.197

Table 5N14 - Differences between patterns of *Stayers* and *Movers* for each strategy type, and technological investments, 1980-96

1980-86

Report
Sum

DYNAMIC	Conv. 86	CAD/CAM/ CAE 86	CNC 86	EDM 86	Wire cutting 86	Laser 86	Quality 86	Test injection 86
Other changes	98.380	1.266	58.255	57.365	0	0	0	0
Defender - always	158.016	2.268	87.678	25.671	0	0	0	0
Prospector - always	385.955	64.195	232.599	126.440	34.272	0	22.803	0
Analyser - always	231.828	220.856	240.177	249.121	136.616	0	2.124	0
Reactor - always	0	0	0	0	0	0	0	0
Defender-Analyser	131.521	1.400	9.949	28.482	0	0	0	0
Defender-Prospector	459.600	50.000	480.000	0	0	0	0	0
Prospector-Analyser	131.627	1.366	29.330	0	0	0	0	0
Analyser-Prospector	47.220	10.493	31.480	10.493	0	0	5.247	0
Reactor-Analyser	46.356	0	15.991	15.991	0	0	0	0
Total	1.690.501	351.845	1.185.461	513.563	170.888	0	30.174	0

1987-92

Report
Sum

DYNAMIC	Conv. 92	CAD/CAM/ CAE 92	CNC 92	EDM 92	Wire cutting 92	Laser 92	Quality 92	Test injection 92
Other changes	212.902	171.163	202.717	215.351	0	0	44.850	0
Defender - always	203.719	391.483	1.084.247	198.710	108.238	0	126.708	73.545
Prospector - always	487.354	749.420	599.171	274.388	62.498	0	78.300	0
Analyser - always	40.246	980.645	303.246	157.451	20.000	0	576.640	0
Reactor - always	0	0	0	0	0	0	0	0
Defender-Analyser	606.039	212.815	167.105	57.356	0	0	21.128	0
Defender-Prospector	0	1.046.000	574.000	570.000	0	0	190.000	0
Prospector-Analyser	1.488	141.143	273.498	187.783	0	0	116.237	7.638
Analyser-Prospector	124.345	65.345	69.845	65.126	0	31.500	50.845	65.126
Reactor-Analyser	61.855	95.905	233.984	13.693	72.540	0	1.968	0
Total	1.737.947	3.853.919	3.507.812	1.739.858	263.276	31.500	1.206.675	146.309

1993-95

Report
Sum

DYNAMIC	Conv. 95	CAD/CAM/ CAE 95	CNC 95	EDM 95	Wire cutting 95	Laser 95	Quality 95	Test injection 95
Other changes	387.517	153.600	477.395	91.849	34.080	0	27.712	148.191
Defender - always	134.302	687.569	1.554.109	276.308	52.563	0	68.871	5.269
Prospector - always	1.267.780	1.486.476	1.739.477	521.167	179.939	0	551.972	301.357
Analyser - always	32.604	175.366	324.585	165.203	1.343.340	0	48.818	0
Reactor - always	0	116.241	0	0	0	0	0	0
Defender-Analyser	49.571	130.482	869.800	258.380	0	0	195.249	0
Defender-Prospector	660.000	810.000	570.000	220.000	0	0	440.000	0
Prospector-Analyser	2.013	77.898	574.222	195.075	191.050	0	71.859	0
Analyser-Prospector	51.634	150.368	161.068	188.537	0	0	51.634	0
Reactor-Analyser	73.358	135.235	331.378	132.768	93.915	0	112.064	328.703
Total	2.658.778	3.923.235	6.602.034	2.049.287	1.894.887	0	1.568.180	783.520

Table 5N14 Cont. - Differences between patterns of *Stayers* and *Movers* for each strategy type, and technological investments, 1980-96

1996

Report
Sum

DYNAMIC	Conv. 96	CAD/CAM/ CAE 96	CNC 96	EDM 96	Wire cutting 96	Laser 96	Quality 96	Test injection 96
Other changes	442.270	245.624	292.757	13.340	0	0	0	544.332
Defender - always	1.772	1.633.148	1.157.156	352.383	129.043	0	169.432	0
Prospector - always	1.945.697	2.091.213	2.147.147	662.620	425.254	0	680.844	266.236
Analyser - always	0	412.499	505.797	78.699	0	0	1.316.184	0
Reactor - always	0	24.398	97.592	0	0	0	0	0
Defender-Analyser	20.189	1.797.856	225.738	161.033	104.839	0	78.629	0
Defender-Prospector	0	604.000	458.000	104.000	0	0	854.000	1.000.000
Prospector-Analyser	4.657	376.982	792.153	9.313	71.903	0	243.991	0
Analyser-Prospector	26.017	187.069	442.172	0	125.069	0	40.017	0
Reactor-Analyser	157.186	282.973	760.903	158.868	0	0	139.006	391.628
Total	2.597.788	7.655.760	6.879.415	1.540.256	856.106	0	3.522.103	2.202.197

Table 5N15 - Means, differences between *Stayer* and *Mover* strategic groups and the firms' benefits offered to customers, 1980-97

Customer benefits 86

Report
Mean

DYNAMIC1	QUAL 86	DELT 86	PRICE 86	TECH 86	DIFF 86	PSALE 86	INN 86	VAR 86	TRUST 86	CREL 86
Defender - always	2,50	2,63	2,25	2,31	1,44	2,69	2,56	1,81	3,56	3,75
Prospector - always	2,75	2,13	2,25	2,38	1,25	2,88	2,38	2,25	3,50	3,13
Analyser - always	3,58	3,42	3,50	3,25	1,67	2,92	1,92	3,42	4,17	4,25
Reactor - always	4,00	2,00	3,00	2,00	1,00	1,00	1,00	1,00	4,00	4,00
Have changed	2,54	2,38	2,31	2,15	1,27	2,12	1,54	1,85	2,88	3,04
Total	2,78	2,60	2,52	2,43	1,38	2,49	1,97	2,17	3,40	3,48

DYNAMIC1	QUAL 86	DELT 86	PRICE 86	TECH 86	DIFF 86	PSALE 86	INN 86	VAR 86	TRUST 86	CREL 86
Defender - always	-0,28	0,02	-0,27	-0,12	0,06	0,20	0,59	-0,36	0,17	0,27
Prospector - always	-0,03	-0,48	-0,27	-0,05	-0,13	0,38	0,41	0,08	0,10	-0,35
Analyser - always	0,81	0,81	0,98	0,82	0,29	0,42	-0,05	1,24	0,77	0,77
Reactor - always	1,22	-0,60	0,48	-0,43	-0,38	-1,49	-0,97	-1,17	0,60	0,52
Have changed	-0,24	-0,22	-0,22	-0,27	-0,11	-0,38	-0,43	-0,33	-0,51	-0,44
Total	0	0	0	0	0	0	0	0	0	0

Customer benefits 92

Report
Mean

DYNAMIC1	QUAL 92	DELT 92	PRICE 92	TECH 92	DIFF 92	PSALE 92	INN 92	VAR 92	TRUST 92	CREL 92
Defender - always	3,56	3,38	2,94	3,19	1,75	3,31	2,50	2,25	4,44	4,63
Prospector - always	3,75	2,88	2,50	3,13	1,75	3,50	3,13	2,88	4,13	3,75
Analyser - always	4,08	3,67	3,67	3,67	2,00	3,42	2,17	3,83	4,58	4,67
Reactor - always	4,00	2,00	3,00	2,00	1,00	1,00	1,00	1,00	4,00	4,00
Have changed	3,62	3,58	3,12	2,88	1,81	3,00	2,04	2,54	4,15	4,23
Total	3,71	3,43	3,10	3,13	1,81	3,19	2,30	2,73	4,30	4,35

DYNAMIC1	QUAL 92	DELT 92	PRICE 92	TECH 92	DIFF 92	PSALE 92	INN 92	VAR 92	TRUST 92	CREL 92
Defender - always	-0,15	-0,05	-0,16	0,06	-0,06	0,12	0,20	-0,48	0,14	0,28
Prospector - always	0,04	-0,55	-0,60	0,00	-0,06	0,31	0,82	0,14	-0,18	-0,60
Analyser - always	0,37	0,24	0,57	0,54	0,19	0,23	-0,13	1,10	0,28	0,32
Reactor - always	0,29	-1,43	-0,10	-1,13	-0,81	-2,19	-1,30	-1,73	-0,30	-0,35
Have changed	-0,10	0,15	0,02	-0,24	0,00	-0,19	-0,26	-0,19	-0,15	-0,12
Total	0	0	0	0	0	0	0	0	0	0

Table 5N15 Cont. - Means, differences between *Stayer* and *Mover* strategic groups and the firms' benefits offered to customers, 1980-97

Customer benefits 95

Report
Mean

DYNAMIC1	QUAL 95	DELT 95	PRICE 95	TECH 95	DIFF 95	PSALE 95	INN 95	VAR 95	TRUST 95	CREL 95
Defender - always	4,25	3,81	3,19	3,94	1,81	3,75	2,56	2,31	4,75	4,94
Prospector - always	4,50	3,50	3,00	3,88	2,13	4,38	3,75	4,00	4,75	4,63
Analyser - always	4,08	3,83	3,42	3,75	2,08	3,50	2,25	4,00	4,58	4,75
Reactor - always	4,00	2,00	3,00	2,00	1,00	1,00	1,00	1,00	4,00	4,00
Have changed	4,08	4,00	3,08	3,50	1,88	3,31	2,35	3,35	4,35	4,38
Total	4,17	3,83	3,16	3,68	1,92	3,56	2,54	3,25	4,54	4,62

DYNAMIC1	QUAL 95	DELT 95	PRICE 95	TECH 95	DIFF 95	PSALE 95	INN 95	VAR 95	TRUST 95	CREL 95
Defender - always	0,08	-0,01	0,03	0,25	-0,11	0,19	0,02	-0,94	0,21	0,32
Prospector - always	0,33	-0,33	-0,16	0,19	0,20	0,82	1,21	0,75	0,21	0,01
Analyser - always	-0,09	0,01	0,26	0,07	0,16	-0,06	-0,29	0,75	0,04	0,13
Reactor - always	-0,17	-1,83	-0,16	-1,68	-0,92	-2,56	-1,54	-2,25	-0,54	-0,62
Have changed	-0,10	0,17	-0,08	-0,18	-0,04	-0,25	-0,19	0,09	-0,19	-0,23
Total	0	0	0	0	0	0	0	0	0	0

Customer benefits 96

Report
Mean

DYNAMIC1	QUAL 96	DELT 96	PRICE 96	TECH 96	DIFF 96	PSALE 96	INN 96	VAR 96	TRUST 96	CREL 96
Defender - always	4,31	4,00	3,25	4,13	1,81	3,75	2,56	2,31	4,75	4,94
Prospector - always	4,75	4,00	3,00	4,00	2,25	4,38	4,13	4,00	4,88	4,75
Analyser - always	4,08	3,83	3,25	3,83	2,25	3,50	2,25	4,00	4,67	4,75
Reactor - always	4,00	2,00	3,00	2,00	1,00	1,00	1,00	1,00	4,00	4,00
Have changed	4,38	4,04	3,04	3,65	1,92	3,62	2,58	3,35	4,65	4,73
Total	4,35	3,95	3,13	3,83	1,98	3,68	2,68	3,25	4,70	4,78

DYNAMIC1	QUAL 96	DELT 96	PRICE 96	TECH 96	DIFF 96	PSALE 96	INN 96	VAR 96	TRUST 96	CREL 96
Defender - always	-0,04	0,05	0,12	0,30	-0,17	0,07	-0,12	-0,94	0,05	0,16
Prospector - always	0,40	0,05	-0,13	0,17	0,27	0,69	1,44	0,75	0,18	-0,03
Analyser - always	-0,27	-0,12	0,12	0,01	0,27	-0,18	-0,43	0,75	-0,03	-0,03
Reactor - always	-0,35	-1,95	-0,13	-1,83	-0,98	-2,68	-1,68	-2,25	-0,70	-0,78
Have changed	0,04	0,09	-0,09	-0,17	-0,06	-0,07	-0,11	0,09	-0,04	-0,05
Total	0	0	0	0	0	0	0	0	0	0

Table 5N15 Cont. - Means, differences between *Stayer* and *Mover* strategic groups and the firms' benefits offered to customers, 1980-97

Customer benefits 97

Report
Mean

DYNAMIC1	QUAL 97	DELT 97	PRICE 97	TECH 97	DIFF 97	PSALE 97	INN 97	VAR 97	TRUST 97	CREL 97
Defender - always	4,31	4,06	3,25	4,19	1,81	3,81	2,69	2,31	4,75	4,94
Prospector - always	4,75	4,00	3,00	4,00	2,25	4,38	4,25	4,13	5,00	4,75
Analyser - always	4,17	3,83	3,33	3,83	2,25	3,50	2,25	4,00	4,67	4,75
Reactor - always	4,00	2,00	3,00	2,00	1,00	1,00	1,00	1,00	4,00	4,00
Have changed	4,35	4,19	2,92	3,85	1,88	3,58	2,58	3,31	4,65	4,62
Total	4,35	4,03	3,10	3,92	1,97	3,68	2,73	3,25	4,71	4,73

DYNAMIC1	QUAL 97	DELT 97	PRICE 97	TECH 97	DIFF 97	PSALE 97	INN 97	VAR 97	TRUST 97	CREL 97
Defender - always	-0,04	0,03	0,15	0,27	-0,16	0,13	-0,04	-0,94	0,04	0,21
Prospector - always	0,40	-0,03	-0,10	0,08	0,28	0,69	1,52	0,87	0,29	0,02
Analyser - always	-0,18	-0,20	0,24	-0,09	0,28	-0,18	-0,48	0,75	-0,05	0,02
Reactor - always	-0,35	-2,03	-0,10	-1,92	-0,97	-2,68	-1,73	-2,25	-0,71	-0,73
Have changed	0,00	0,16	-0,17	-0,07	-0,08	-0,11	-0,15	0,05	-0,06	-0,11
Total	0	0	0	0	0	0	0	0	0	0

Table 5N16 - Means, differences between patterns of *Stayers* and *Movers* for each strategy types, and the benefits offered to customers, 1980-97

1980-86

Report
Means

DYNAMIC	QUAL 86	DELT 86	PRICE 86	TECH 86	DIFF 86	PSALE 86	INN 86	VAR 86	TRUST 86	CREL 86
Other changes	0,62	0,20	0,28	-0,43	-0,18	0,11	-0,37	-0,77	-0,80	-0,48
Defender-always	-0,28	0,02	-0,27	-0,12	0,06	0,20	0,59	-0,36	0,17	0,27
Prospector-always	-0,03	-0,48	-0,27	-0,05	-0,13	0,38	0,41	0,08	0,10	-0,35
Analyser-always	0,81	0,81	0,98	0,82	0,29	0,42	-0,05	1,24	0,77	0,77
Reactor-always	1,22	-0,60	0,48	-0,43	-0,38	-1,49	-0,97	-1,17	0,60	0,52
Defender-Analyser	0,02	0,00	0,28	0,17	0,42	0,31	-0,17	0,03	-0,20	0,12
Defender-Prospector	1,22	1,40	1,48	1,57	0,62	-0,16	-0,63	0,49	0,94	0,86
Prospector-Analyser	-0,18	-0,20	-0,32	-0,23	-0,18	-0,29	-0,17	0,23	0,60	0,52
Analyser-Prospector	-1,11	-1,27	-1,86	-1,10	-0,71	-1,16	-0,30	-0,84	-1,73	-1,81
Reactor-Analyser	-1,78	-1,20	-1,12	-1,23	-0,58	-1,29	-0,97	-0,97	-1,80	-1,88

1987-92

DYNAMIC	QUAL 92	DELT 92	PRICE 92	TECH 92	DIFF 92	PSALE 92	INN 92	VAR 92	TRUST 92	CREL 92
Other changes	0,89	0,37	0,10	-0,13	-0,41	0,41	-0,50	-0,73	-0,30	0,05
Defender-always	-0,15	-0,05	-0,16	0,06	-0,06	0,12	0,20	-0,48	0,14	0,28
Prospector-always	0,04	-0,55	-0,60	0,00	-0,06	0,31	0,82	0,14	-0,18	-0,60
Analyser-always	0,37	0,24	0,57	0,54	0,19	0,23	-0,13	1,10	0,28	0,32
Reactor-always	0,29	-1,43	-0,10	-1,13	-0,81	-2,19	-1,30	-1,73	-0,30	-0,35
Defender-Analyser	-0,51	-0,63	0,10	-0,13	0,19	-0,19	-0,50	-0,33	-0,70	-0,55
Defender-Prospector	0,29	0,90	0,90	0,87	0,52	-0,86	-0,63	-0,06	0,03	-0,02
Prospector-Analyser	0,09	0,37	-0,30	0,07	-0,01	0,01	0,10	0,27	0,70	0,65
Analyser-Prospector	0,29	1,24	-0,43	-0,46	0,86	0,48	1,37	0,60	0,03	0,32
Reactor-Analyser	-1,31	-0,63	-0,10	-1,33	-0,61	-0,99	-0,90	-0,53	-0,50	-0,95

1993-95

Report
Means

DYNAMIC	QUAL 95	DELT 95	PRICE 95	TECH 95	DIFF 95	PSALE 95	INN 95	VAR 95	TRUST 95	CREL 95
Other changes	0,43	0,17	-0,36	0,12	-0,52	0,24	-0,54	-0,46	-0,34	-0,42
Defender-always	0,08	-0,01	0,03	0,25	-0,11	0,19	0,02	-0,75	0,21	0,32
Prospector-always	0,33	-0,33	-0,16	0,19	0,20	0,82	1,21	0,56	0,21	0,01
Analyser-always	-0,09	0,01	0,26	0,07	0,16	-0,06	-0,29	0,85	0,04	0,13
Reactor-always	-0,17	-1,83	-0,16	-1,68	-0,92	-2,56	-1,54	-2,06	-0,54	-0,62
Defender-Analyser	0,03	-0,43	0,24	-0,28	0,08	-0,36	-0,54	-0,46	-0,74	-0,42
Defender-Prospector	-0,17	0,84	0,51	0,32	0,41	-1,22	-0,54	-0,06	-0,21	-0,29
Prospector-Analyser	0,03	0,17	-0,56	-0,08	0,08	-0,36	0,26	0,54	0,46	0,38
Analyser-Prospector	-0,17	0,84	-0,49	-0,68	0,75	0,11	1,13	0,60	0,13	0,05
Reactor-Analyser	-0,77	-0,03	0,24	-0,48	-0,52	-0,16	-0,54	-0,06	-0,34	-0,62

Table 5N16 Cont. - Means, differences between patterns of *Stayers* and *Movers* for each strategy type, and the benefits offered to customers, 1980-97

1996

Report
Means

DYNAMIC	QUAL 96	DELT 96	PRICE 96	TECH 96	DIFF 96	PSALE 96	INN 96	VAR 96	TRUST 96	CREL 96
Other changes	0,45	0,05	-0,33	-0,23	-0,58	0,12	-0,48	-0,45	-0,50	-0,58
Defender-always	-0,04	0,05	0,12	0,30	-0,17	0,07	-0,12	-0,94	0,05	0,16
Prospector-always	0,40	0,05	-0,13	0,17	0,27	0,69	1,44	0,75	0,18	-0,03
Analyser-always	-0,27	-0,12	0,12	0,01	0,27	-0,18	-0,43	0,75	-0,03	-0,03
Reactor-always	-0,35	-1,95	-0,13	-1,83	-0,98	-2,68	-1,68	-2,25	-0,70	-0,78
Defender-Analyser	0,25	-0,35	0,07	-0,03	0,22	-0,08	-0,28	-0,25	-0,10	0,02
Defender-Prospector	0,32	0,71	0,54	0,51	0,35	-0,02	-0,35	-0,25	0,30	0,22
Prospector-Analyser	-0,15	0,25	-0,53	-0,23	0,02	-0,48	0,32	0,55	0,30	0,22
Analyser-Prospector	-0,02	0,38	-0,46	-0,83	0,68	-0,02	0,98	0,75	-0,03	-0,11
Reactor-Analyser	-0,55	-0,15	0,27	-0,23	-0,58	0,12	-0,48	0,35	-0,10	0,02

1997

Report
Means

DYNAMIC	QUAL 97	DELT 97	PRICE 97	TECH 97	DIFF 97	PSALE 97	INN 97	VAR 97	TRUST 97	CREL 97
Other changes	-0,22	0,09	-0,47	-0,42	-0,22	0,07	0,02	-0,25	-0,34	-0,73
Defender-always	-0,04	0,03	0,15	0,27	-0,16	0,13	-0,04	-0,94	0,04	0,21
Prospector-always	0,40	-0,03	-0,10	0,08	0,28	0,69	1,52	0,87	0,29	0,02
Analyser-always	-0,18	-0,20	0,24	-0,09	0,28	-0,18	-0,48	0,75	-0,05	0,02
Reactor-always	-0,35	-2,03	-0,10	-1,92	-0,97	-2,68	-1,73	-2,25	-0,71	-0,73
Defender-Analyser	0,25	-0,23	0,10	0,48	0,23	0,12	-0,13	-0,25	-0,11	0,07
Defender-Prospector	0,32	0,63	0,57	0,41	0,37	0,32	-0,40	0,08	0,29	0,27
Prospector-Analyser	-0,35	0,30	-0,76	-0,25	-0,30	-1,35	-0,40	0,41	0,29	0,27
Analyser-Prospector	0,15	0,47	-0,60	-1,42	0,53	-0,68	0,77	0,75	-0,21	-0,23
Reactor-Analyser	0,05	0,17	0,10	0,28	-0,57	0,12	-0,53	0,35	0,09	0,27

Table 5N17 - Means, differences between *Stayer* and *Mover* strategic groups and what firms subcontract, 1980-97

1980-86

Report
Mean

DYNAMIC1	Sub. Product definition -product design 86	Sub. Product definition-prototyping 86	Sub. Mould design 86	Sub. CAD/CAM/CAE 86	Sub. Mould manufacture-Complete mould 86	Sub. Mould manufacture-Parts of the mould 86	Sub. Mould try out 86	Sub. Mould base 86	Sub. Assembling 86
Defender - always	0,63	0,00	4,06	14,31	2,69	19,69	27,13	6,50	0,00
Prospector - always	0,00	0,00	6,50	1,50	11,88	26,75	15,38	13,00	0,00
Analyser - always	4,00	0,00	10,08	0,00	11,92	16,25	36,58	12,83	0,00
Reactor always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Have changed	0,00	0,00	9,69	4,69	5,96	23,19	20,08	3,31	0,00
Total	0,92	0,00	8,73	6,08	6,92	21,22	24,25	7,11	0,00

1987-92

Report
Mean

DYNAMIC1	Sub. Product definition -product design 92	Sub. Product definition-prototyping 92	Sub. Mould design 92	Sub. CAD/CAM/CAE 92	Sub. Mould manufacture-Complete mould 92	Sub. Mould manufacture-Parts of the mould 92	Sub. Mould try out 92	Sub. Mould base 92	Sub. Assembling 92
Defender - always	2,25	1,56	5,38	5,50	2,69	31,38	27,63	17,38	0,00
Prospector - always	0,00	0,00	6,88	5,25	15,13	14,50	26,88	18,88	0,00
Analyser - always	2,58	0,83	7,75	1,50	12,17	17,25	40,58	14,92	0,08
Reactor always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Have changed	0,19	0,00	11,12	8,69	8,12	26,65	21,27	8,46	1,15
Total	1,14	0,56	9,25	6,25	8,27	24,25	27,10	13,14	0,49

1993-95

Report
Mean

DYNAMIC1	Sub. Product definition -product design 95	Sub. Product definition-prototyping 92	Sub. Mould design 95	Sub. CAD/CAM/CAE 95	Sub. Mould manufacture-Complete mould 95	Sub. Mould manufacture-Parts of the mould 95	Sub. Mould try out 95	Sub. Mould base 95	Sub. Assembling 95
Defender - always	3,44	3,13	8,69	6,88	3,69	29,00	29,31	17,13	0,13
Prospector - always	0,63	0,25	7,50	4,63	21,00	17,13	30,25	18,63	0,00
Analyser - always	3,42	0,83	8,92	0,75	10,42	17,67	40,58	16,58	0,08
Reactor always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Have changed	0,19	0,31	11,31	12,23	13,08	24,88	19,73	11,81	0,58
Total	1,68	1,11	10,48	7,84	10,98	23,33	27,32	14,75	0,29

Table 5N17 Cont. - Means, differences between *Stayer* and *Mover* strategic groups and what firms subcontract, 1980-97

1996

Report
Mean

DYNAMIC1	Sub. Product definition-product design 96	Sub. Product definition-prototyping 96	Sub. Mould design 96	Sub. CAD/CAM/CAE 96	Sub. Mould manufacture-Complete mould 96	Sub. Mould manufacture-Parts of the mould 96	Sub. Mould try out 96	Sub. Mould base 96	Sub. Assembling 96
Defender - always	3,44	3,13	7,00	5,19	4,31	32,69	27,88	18,25	0,56
Prospector - always	1,25	0,88	7,63	7,13	24,00	15,25	27,00	14,63	0,63
Analyser - always	4,75	1,04	7,75	2,17	10,04	17,00	37,29	19,13	0,08
Reactor always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Have changed	0,35	0,54	13,04	9,88	13,81	25,35	17,23	6,58	0,58
Total	2,08	1,33	10,56	7,03	11,75	24,10	24,88	12,85	0,48

1997

Report
Mean

DYNAMIC1	Sub. Product definition-product design 97	Sub. Product definition-prototyping 97	Sub. Mould design 97	Sub. CAD/CAM/CAE 97	Sub. Mould manufacture-Complete mould 97	Sub. Mould manufacture-Parts of the mould 97	Sub. Mould try out 97	Sub. Mould base 97	Sub. Assembling 97
Defender - always	3,56	3,13	8,69	7,06	3,00	34,38	21,94	17,63	0,56
Prospector - always	1,25	0,63	7,63	4,00	25,00	15,13	27,13	16,38	1,25
Analyser - always	3,92	0,75	8,75	0,75	12,42	17,33	35,25	20,00	0,08
Reactor always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Have changed	0,46	0,62	11,62	9,27	13,73	24,00	17,65	10,50	0,58
Total	2,00	1,27	10,59	6,59	11,97	24,02	23,17	14,70	0,56

Figure 5N18 - Means, differences between patterns of *Stayers* and *Movers* for each strategy type, and what firms subcontract, 1980-97

1980-86

Report
Mean

DYNAMIC	Sub. Product definition-Product design 86	Sub. Product definition -prototyping 86	Sub. Mould design 86	Sub. CAD/CAM/ CAE 86	Sub. Mould manufacture-Complete mould 86	Sub. Mould manufacture-Parts of the mould 86	Sub. Mould try out 86	Sub. Mould base 86	Sub. Assembling 86
Other changes	0,00	0,00	12,13	3,13	0,00	12,13	26,63	3,50	0,00
Defender-always	0,63	0,00	4,06	14,31	2,69	19,69	27,13	6,50	0,00
Prospector-always	0,00	0,00	6,50	1,50	11,88	26,75	15,38	13,00	0,00
Analyser-always	4,00	0,00	10,08	0,00	11,92	16,25	36,58	12,83	0,00
Reactor-always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Defender-Analyser	0,00	0,00	15,00	7,60	11,40	40,00	24,00	2,00	0,00
Defender-Prospector	0,00	0,00	3,33	16,67	0,00	36,67	36,67	0,00	0,00
Prospector-Analyser	0,00	0,00	9,67	3,00	16,00	28,00	1,67	8,33	0,00
Analyser-Prospector	0,00	0,00	15,50	0,00	0,00	15,50	12,50	6,50	0,00
Reactor-Analyser	0,00	0,00	2,00	0,00	10,00	16,20	9,80	2,00	0,00
Total	0,92	0,00	8,73	6,08	6,92	21,22	24,25	7,11	0,00

1987-92

Report
Mean

DYNAMIC	Sub. Product definition-Product design 92	Sub. Product definition -prototyping 92	Sub. Mould design 92	Sub. CAD/CAM/ CAE 92	Sub. Mould manufacture-Complete mould 92	Sub.Mould manufacture-Parts of the mould 92	Sub. Mould try out 92	Sub. Mould base 92	Sub. Assembling 92
Other changes	0,63	0,00	12,75	14,50	0,00	18,88	26,25	7,75	2,50
Defender-always	2,25	1,56	5,38	5,50	2,69	31,38	27,63	17,38	0,00
Prospector-always	0,00	0,00	6,88	5,25	15,13	14,50	26,88	18,88	0,00
Analyser-always	2,58	0,83	7,75	1,50	12,17	17,25	40,58	14,92	0,08
Reactor-always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Defender-Analyser	0,00	0,00	14,40	6,20	14,60	41,00	21,80	2,00	0,00
Defender-Prospector	0,00	0,00	0,67	13,33	0,00	36,00	37,00	0,00	0,00
Prospector-Analyser	0,00	0,00	9,67	3,00	16,00	28,00	1,67	41,67	0,00
Analyser-Prospector	0,00	0,00	22,00	0,00	20,00	37,50	9,00	6,50	5,00
Reactor-Analyser	0,00	0,00	8,00	6,00	10,00	14,00	20,00	2,00	0,00
Total	1,14	0,56	9,25	6,25	8,27	24,25	27,10	13,14	0,49

Figure 5N18 Cont. - Means, differences between patterns of *Stayers* and *Movers* for each strategy type, and what firms subcontract, 1980-97

1993-95

Report
Mean

DYNAMIC	Sub. Product definition-Product design 95	Sub. Product definition -prototyping 95	Sub. Mould design 95	Sub. CAD/CAM/ CAE 95	Sub. Mould manufacture-Complete mould 95	Sub. Mould manufacture-Parts of the mould 95	Sub. Mould try out 95	Sub. Mould base 95	Sub. Assembling 95
Other changes	0,63	0,00	16,63	19,25	11,63	12,63	17,00	6,63	0,63
Defender-always	3,44	3,13	8,69	6,88	3,69	29,00	29,31	17,13	0,13
Prospector-always	0,63	0,25	7,50	4,63	21,00	17,13	30,25	18,63	0,00
Analyser-always	3,42	0,83	8,92	0,75	10,42	17,67	40,58	16,58	0,08
Reactor-always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Defender-Analyser	0,00	0,60	11,80	15,20	17,80	36,20	15,20	3,20	0,00
Defender-Prospector	0,00	0,00	0,67	11,00	0,00	37,00	40,33	0,00	0,00
Prospector-Analyser	0,00	0,00	9,67	3,00	16,00	28,00	1,67	41,67	0,00
Analyser-Prospector	0,00	2,50	17,00	5,00	15,00	30,00	11,50	14,00	5,00
Reactor-Analyser	0,00	0,00	7,40	7,20	16,00	22,00	30,40	17,00	0,00
Total	1,68	1,11	10,48	7,84	10,98	23,33	27,32	14,75	0,29

1996

Report
Mean

DYNAMIC	Sub. Product definition-Product design 96	Sub. Product definition -prototyping 96	Sub. Mould design 96	Sub. CAD/CAM/ CAE 96	Sub.Mould manufacture-Complete mould 96	Sub. Mould manufacture-Parts of the mould 96	Sub. Mould try out 96	Sub. Mould base 96	Sub. Assembling 96
Other changes	0,63	0,00	21,00	10,25	13,63	14,13	10,75	5,75	0,63
Defender-always	3,44	3,13	7,00	5,19	4,31	32,69	27,88	18,25	0,56
Prospector-always	1,25	0,88	7,63	7,13	24,00	15,25	27,00	14,63	0,63
Analyser-always	4,75	1,04	7,75	2,17	10,04	17,00	37,29	19,13	0,08
Reactor-always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Defender-Analyser	0,80	0,80	10,60	14,60	18,40	35,60	14,80	4,40	0,00
Defender-Prospector	0,00	0,00	0,33	12,33	0,00	45,00	30,00	0,00	0,00
Prospector-Analyser	0,00	0,00	9,67	3,00	16,00	28,00	1,67	8,33	0,00
Analyser-Prospector	0,00	5,00	17,50	11,50	15,00	20,00	11,50	11,50	5,00
Reactor-Analyser	0,00	0,00	10,60	6,60	16,00	21,80	34,00	11,00	0,00
Total	2,08	1,33	10,56	7,03	11,75	24,10	24,88	12,85	0,48

1997

Report
Mean

DYNAMIC	Sub. Product definition-Product design 97	Sub. Product definition -prototyping 97	Sub. Mould design 97	Sub. CAD/CAM/ CAE 97	Sub.Mould manufacture-Complete mould 97	Sub. Mould manufacture-Parts of the mould 97	Sub. Mould try out 97	Sub. Mould base 97	Sub. Assembling 97
Other changes	0,63	0,25	19,25	9,38	13,13	12,63	10,75	6,50	0,63
Defender-always	3,56	3,13	8,69	7,06	3,00	34,38	21,94	17,63	0,56
Prospector-always	1,25	0,63	7,63	4,00	25,00	15,13	27,13	16,38	1,25
Analyser-always	3,92	0,75	8,75	0,75	12,42	17,33	35,25	20,00	0,08
Reactor-always	0,00	0,00	60,00	20,00	0,00	10,00	10,00	0,00	0,00
Defender-Analyser	1,40	0,80	8,80	15,80	18,80	27,20	14,40	4,80	0,00
Defender-Prospector	0,00	0,00	0,00	7,33	0,00	48,00	26,00	0,00	0,00
Prospector-Analyser	0,00	0,00	9,67	3,00	16,00	28,00	1,67	41,67	0,00
Analyser-Prospector	0,00	5,00	15,00	11,50	15,00	21,00	16,00	11,50	5,00
Reactor-Analyser	0,00	0,00	9,00	6,60	16,00	23,40	37,20	9,80	0,00
Total	2,00	1,27	10,59	6,59	11,97	24,02	23,17	14,70	0,56

Appendix 5O - Differences between the dynamics of strategy types and organisational performance

Table 5O1 - Means, differences between *Stayer* and *Mover* strategic groups and the organisational performance ratios, 1980-96

Report
Mean

DYNAMIC1	Profit margin 86	Return on equity (ROE) 86	Return on assets (ROA) 86	Return on sales (ROS) 86	Sales growth 86	Sales/moulds 86
Defender - always	5,42	16,78	5,61	288,76	507,25	1.633,45
Prospector - always	4,32	7,15	2,87	160,97	166,50	2.539,23
Analyser - always	5,19	34,77	5,41	108,83	140,77	2.344,70
Have changed	5,32	29,33	6,93	115,90	215,52	2.260,63
Total	5,18	25,09	5,72	159,76	256,35	2.222,30
Std. Deviation	4,70	33,57	8,16	187,34	498,60	1.387,10

DYNAMIC1	Profit margin 86	Return on equity (ROE) 86	Return on assets (ROA) 86	Return on sales (ROS) 86	Sales growth 86	Sales/moulds 86
Defender - always	0,05	-0,25	-0,01	0,69	0,50	-0,42
Prospector - always	-0,18	-0,53	-0,35	0,01	-0,18	0,23
Analyser - always	0,00	0,29	-0,04	-0,27	-0,23	0,09
Have changed	0,03	0,13	0,15	-0,23	-0,08	0,03
Total	0,00	0,00	0,00	0,00	0,00	0,00

Report
Mean

DYNAMIC1	Profit margin 92	Return on equity (ROE) 92	Return on assets (ROA) 92	Return on sales (ROS) 92	Sales growth 92	Sales/moulds 92
Defender - always	-1,09	8,17	1,45	99,95	70,73	3.882,85
Prospector - always	0,02	-52,04	-53,68	88,49	32,78	6.641,86
Analyser - always	-0,37	-7,64	1,41	88,13	50,09	4.095,82
Have changed	0,87	3,47	1,03	137,97	113,45	4.636,29
Total	0,05	-4,70	-5,76	112,72	80,41	4.604,79
Std. Deviation	5,61	61,00	51,60	67,56	99,17	2.341,76

DYNAMIC1	Profit margin 92	Return on equity (ROE) 92	Return on assets (ROA) 92	Return on sales (ROS) 92	Sales growth 92	Sales/moulds 92
Defender - always	-0,20	0,21	0,14	-0,19	-0,10	-0,31
Prospector - always	0,00	-0,78	-0,93	-0,36	-0,48	0,87
Analyser - always	-0,07	-0,05	0,14	-0,36	-0,31	-0,22
Have changed	0,15	0,13	0,13	0,37	0,33	0,01
Total	0	0	0	0	0	0

Table 5O1 Cont. - Means, differences between *Stayer* and *Mover* strategic groups and the organisational performance ratios, 1980-96

Report
Mean

DYNAMIC1	Profit margin 95	Return on equity (ROE) 95	Return on assets (ROA) 95	Return on sales (ROS) 95	Sales growth 95	Sales/moulds 95
Defender - always	1,27	7,55	2,54	88,61	29,41	5.372,88
Prospector - always	1,81	117,64	113,63	109,90	42,18	8.213,66
Analyser - always	1,92	25,26	2,38	96,47	22,47	5.969,04
Reactor always	0,00	0,00	0,00	1.031,75	1.444,09	486,17
Have changed	-0,43	-0,85	0,37	110,95	37,06	6.350,08
Total	0,73	22,75	17,14	119,07	57,90	6.209,90
Std. Deviation	3,83	121,38	119,07	132,08	190,87	4.269,27

DYNAMIC1	Profit margin 95	Return on equity (ROE) 95	Return on assets (ROA) 95	Return on sales (ROS) 95	Sales growth 95	Sales/moulds 95
Defender - always	0,14	-0,13	-0,12	-0,23	-0,15	-0,20
Prospector - always	0,28	0,78	0,81	-0,07	-0,08	0,47
Analyser - always	0,31	0,02	-0,12	-0,17	-0,19	-0,06
Reactor always	-0,19	-0,19	-0,14	6,91	7,26	-1,34
Have changed	-0,30	-0,19	-0,14	-0,06	-0,11	0,03
Total	0,00	0,00	0,00	0,00	0,00	0,00

Report
Mean

DYNAMIC1	Profit margin 96	Return on equity (ROE) 96	Return on assets (ROA) 96	Return on sales (ROS) 96	Sales/moulds 96	Asset intensity 96	Sales per number employees 96	Profit per employee 96
Defender - always	1,19	7,62	2,07	88,56	6.945,53	6.373,69	7.565,77	80,81
Prospector - always	3,44	23,55	10,81	75,17	10.640,30	7.473,16	10.074,29	454,87
Analyser - always	2,05	9,64	2,10	87,30	7.699,49	6.178,24	6.752,21	158,85
Reactor always	0,15	1,60	0,19	77,84	6.408,34	5.681,17	7.298,39	10,94
Have changed	1,87	12,76	2,46	96,52	7.435,13	6.321,41	6.880,37	125,74
Total	1,91	12,16	3,37	89,68	7.785,44	6.451,13	7.461,05	162,55
Std. Deviation	2,55	24,88	7,89	41,81	5.222,56	3.770,26	3.191,44	315,28

DYNAMIC1	Profit margin 96	Return on equity (ROE) 96	Return on assets (ROA) 96	Return on sales (ROS) 96	Sales/moulds 96	Asset intensity 96	Sales per number employees 96	Profit per employee 96
Defender - always	-0,28	-0,18	-0,16	-0,03	-0,16	-0,02	0,03	-0,26
Prospector - always	0,60	0,46	0,94	-0,35	0,55	0,27	0,82	0,93
Analyser - always	0,05	-0,10	-0,16	-0,06	-0,02	-0,07	-0,22	-0,01
Reactor always	-0,69	-0,42	-0,40	-0,28	-0,26	-0,20	-0,05	-0,48
Have changed	-0,02	0,02	-0,12	0,16	-0,07	-0,03	-0,18	-0,12
Total	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 5O2 - Differences between patterns of *Stayers and Movers* for each strategy type, and organisational performance, 1996

Report
Mean

DYNAMIC	Profit margin 96	Return on equity (ROE) 96	Return on assets (ROA) 96	Return on sales (ROS) 96	Sales/moulds 96	Asset intensity 96	Sales per number employees 96	Profit per employee 96
Other changes	1,98	8,82	2,94	97,02	7.829,52	5.771,08	6.304,07	145,54
Defender - always	1,19	7,62	2,07	88,56	6.945,53	6.373,69	7.565,77	80,81
Prospector - always	3,44	23,55	10,81	75,17	10.640,30	7.473,16	10.074,29	454,87
Analyser - always	2,05	9,64	2,10	87,30	7.699,49	6.178,24	6.752,21	158,85
Reactor always	0,15	1,60	0,19	77,84	6.408,34	5.681,17	7.298,39	10,94
Defender-Analyser	1,34	34,09	1,59	108,46	6.925,68	6.323,43	5.633,01	67,12
Defender-Prospector	1,35	2,08	1,00	117,48	11.420,84	8.084,31	7.239,22	69,90
Prospector-Analyser	1,60	6,39	1,61	102,04	7.429,84	8.718,32	8.545,35	137,28
Analyser-Prospector	0,42	4,04	2,58	78,32	6.738,21	6.004,08	9.882,75	46,07
Reactor-Analyser	3,17	9,32	3,59	79,37	6.001,21	5.183,57	6.706,32	199,96
Std. Deviation	2,55	24,88	7,89	41,81	5.222,56	3.770,26	3.191,44	315,28

DYNAMIC	Profit margin 96	Return on equity (ROE) 96	Return on assets (ROA) 96	Return on sales (ROS) 96	Sales/moulds 96	Asset intensity 96	Sales per number employees 96	Profit per employee 96
Other changes	-0,47	-0,02	-0,08	0,42	0,35	0,16	-0,13	-0,17
Defender - always	-0,78	-0,07	-0,19	0,22	0,18	0,32	0,27	-0,38
Prospector - always	0,10	0,57	0,91	-0,10	0,89	0,61	1,06	0,81
Analyser - always	-0,44	0,01	-0,19	0,19	0,33	0,26	0,01	-0,13
Reactor always	-1,19	-0,31	-0,43	-0,04	0,08	0,13	0,19	-0,60
Defender-Analyser	-1,19	-0,31	-0,43	-0,04	0,08	0,13	0,19	-0,60
Defender-Prospector	-0,72	1,00	-0,25	0,70	0,18	0,30	-0,34	-0,42
Prospector-Analyser	-0,72	-0,29	-0,33	0,91	1,04	0,77	0,17	-0,41
Analyser-Prospector	-0,62	-0,12	-0,25	0,54	0,27	0,94	0,58	-0,20
Reactor-Analyser	-1,08	-0,21	-0,13	-0,03	0,14	0,22	1,00	-0,49
Total	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00